Dräger
MEDICAL

Evita 2 dura

Intensive Care Ventilator

Instructions for Use
Software 4.n

1-251-96

Working with these Instructions for Use

Header line – the title...
of the main chapter
The title of the specific sub-section is printed underneath the main header – to help you find your way quickly from subject to subject.

Page body...
the Instructions for Use
in combined text/illustrations. The information is expressed in the form of practical actions, giving the user direct hands-on experience in learning how to use the machine.

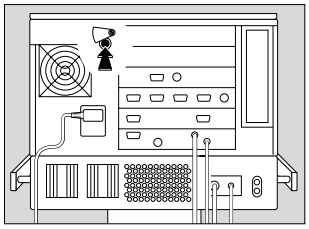
Left-hand column...
the text
provides explanations and instructs the user step-by-step in the practical use of the product, with short, clear instructions in easy-to-follow sequence.
Bullet points indicate separate actions. Where several actions are described, numbers are used both to refer to the relevant details in the illustrations and to specify the sequence of actions.

Right-hand column...
the illustrations
provide the visual reference for the text and make it easier to locate the various parts of the equipment. Elements mentioned in the text are highlighted. Unnecessary details are avoided.
Screen displays prompt the user to proceed and confirm correct actions.

Starting up

Switching on

Push in power switch on back panel until it clicks into place = ON.
The flap comes down over the switch to prevent it being inadvertently switched off.



Evita 2 dura runs a self-test.

Wait until the 10-second test phase is complete.

Evita 2 dura always begins ventilation with the start-up values marked by an arrow on the on-screen knobs. To select these start-up values, please refer to pages 62 onwards.
After power cuts and after standby mode, the settings valid immediately before the interruption of operation remain in use.

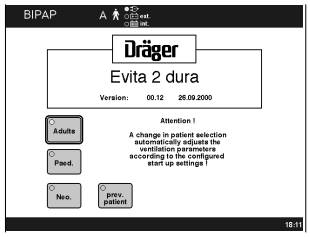
Patient mode

After switching on, Evita 2 dura displays a choice of patient modes:

- »**Adults**« = adult patients
- »**Paed.**« = children
- »**Neo.**« = neonates
  (when using the "NeoFlow" option)
- »**prev. patient**« = previous patient

Example:

Adult ventilation



With this information, Evita 2 dura defines the adjustment ranges and the start-up values of the ventilation parameters.

The starting procedure, with selection of the patient mode, can be configured by the user, see Configuration on page 55 onwards.

What's new in Evita 2 dura software 4.n

Specification of the humidifier used

– »Active humidifier«
  or
– »HME/Filter« (artificial nose)
– for more accurate measurement of the volume parameters

Apnoea ventilation On/Off

– can be selected as starting configuration

Extended range of settings for the alarm time T_{Apnoea}

– from 5 to 60 seconds
  (formerly 15 to 60 seconds)

Ventilation mode BIPAP$_{Assist}$

– for pressure-controlled assisted ventilation

Patient mode »prev. patient« can be selected

– to adopt the settings, including alarms, which were effective before switching off the equipment

Leakage compensation On/Off

– for activation and deactivation of the automatic leakage compensation function

Monitoring of tube blockages

– New alarm message »Tube blocked !!!«

Additional weaning parameters

available as software version 4.n plus upgrade
in addition to the parameter occlusion pressure P 0.1
Evita 2 dura 4.n also determines the parameters

– RSB Rapid Shallow Breathing index
  and
– NIF Negative Inspiratory Force index
– f_{spn} and MV_{spn} as trend

External flow source

available as software version 4.n plus upgrade

– The amount of external flow is calculated by Evita 2 dura 4.n (e.g. for additional tracheal gas insufflation) and adjusts the volume monitoring tolerances in order to avoid inadvertent alarms

Evita Remote (Remote Pad)
optionally available

– Remote control pad for parallel remote operation of function keys on Evita 2 dura 4.n

NIV
optionally available

– Application mode to support non-invasive ventilation therapies

Nurse call
optionally available

– Socket for connecting alarm signals to a central alarm station in the hospital

Simplified settings
under "other modes"

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For Your Safety and that of Your Patients

Strictly follow the Instructions for Use

Any use of the apparatus requires full understanding and strict observation of these instructions. The apparatus is only to be used for purposes specified here.

Maintenance

The apparatus must be inspected and serviced regularly by trained service personnel at six monthly intervals. Repair and general overhaul of the apparatus may only be carried out by trained service personnel.
We recommend that a service contract be obtained with DrägerService and that all repairs also be carried out by them. Only authentic Dräger spare parts may be used for maintenance.
Observe chapter "Maintenance Intervals".

Accessories

Do not use accessory parts other than those in the order list.

Not for use in areas of explosion hazard

This apparatus is neither approved nor certified for use in areas where combustible or explosive gas mixtures are likely to occur.

Safe connection with other electrical equipment

Electrical connections to equipment which is not listed in these Instructions for Use should only be made following consultations with the respective manufacturers or an expert.

Liability for proper function or damage

The liability for the proper function of the apparatus is irrevocably transferred to the owner or operator to the extent that the apparatus is serviced or repaired by personnel not employed or authorised by DrägerService or if the apparatus is used in a manner not conforming to its intended use.

Dräger cannot be held responsible for damage caused by non-compliance with the recommendations given above. The warranty and liability provisions of the terms of sale and delivery of Dräger are likewise not modified by the recommendations given above.

Dräger Medical AG & Co. KGaA

Safe use of the equipment

This equipment must only be used under the supervision of qualified medical staff, so that help is available immediately if any faults or malfunctions occur.

This equipment must not be used with flammable gases or anaesthetic agents. Danger of fire!

Do not use mobile telephones within 10 metres of ventilators!
Mobile telephones may impair the functioning of electromedical equipment and endanger the patient[1)].

Appropriate ventilation monitoring

The built-in monitoring facilities of Evita 2 dura ensure appropriate monitoring of ventilation therapy and therefore detect any undesirable changes in the following ventilation parameters:

- Airway pressure, Paw
- Expiratory minute volume, MV
- Inspiratory O_2 concentration, FiO_2
- Inspiratory breathing gas temperature, T
- Expiratory CO_2 concentration, $etCO_2$ (optional)
- Inspiratory breathing volume, V_{TI}
- Apnoea time
- Tachypnoea monitoring

Changes in these parameters may be caused by:

- Acute changes in the patient's condition
- Incorrect settings and faulty handling
- Equipment malfunctions
- Failure of power and gas supplies

If a fault occurs in this equipment, separate measuring instruments should be used.

Back-up ventilation with an independent manual ventilation device

If a fault is detected in Evita 2 dura so that its life-support functions are no longer assured, ventilation using an independent ventilation device must be started without delay – if necessary with PEEP and/or increased inspiratory O_2 concentration (e.g. with the Dräger Resutator 2000).

1) Dräger medical equipment meets the requirements for immunity to interference in accordance with the specific product standards and EN 60601-1-2 (IEC 601-1-2). Depending on the type of mobile telephone used and on the application situation, however, field strengths exceeding the values specified in the applicable standards may develop in the immediate vicinity of the mobile telephone and therefore lead to faults and malfunctions.

Intended Medical Application

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Intended Medical Application

Evita 2 dura
Long-term ventilator for intensive care.
For adults, children and neonates.

With the following ventilation modes:

IPPV Intermittent **P**ositive **P**ressure **V**entilation
controlled and assisted constant-volume ventilation.
With the options:
– **CPPV** (**C**ontinuous **P**ositive **P**ressure **V**entilation)
– **PLV** (**P**ressure **L**imited **V**entilation)
– **AutoFlow**®* (optional)
for automatic regulation of inspiration flow
– **IRV** (**I**nversed **R**atio **V**entilation)

SIMV Synchronized **I**ntermittent **M**andatory **V**entilation
Procedure for weaning patients off the ventilator after they have started spontaneous breathing.
With the options:
– **PLV** (**P**ressure **L**imited **V**entilation)
– **AutoFlow**® (optional)
for automatic regulation of inspiration flow

MMV Mandatory **M**inute Volume **V**entilation
Spontaneous breathing with automatic adjustment of mandatory ventilation to the patient's minute volume requirement.
With the options:
– **PLV** (**P**ressure **L**imited **V**entilation)
– **AutoFlow**® (optional)
for automatic regulation of inspiration flow

SB Spontaneous **B**reathing
Spontaneous breathing at ambient pressure

CPAP Continuous **P**ositive **A**irway **P**ressure
Spontaneous breathing with positive airway pressure

ASB Assisted **S**pontaneous **B**reathing
Pressure-assisted spontaneous breathing

BIPAP* Biphasic **P**ositive **A**irway **P**ressure
Pressure-controlled ventilation combined with free spontaneous breathing during the complete breathing cycle, and adjustable pressure increase to CPAP level.

BIPAPAssist (**Bi**phasic **P**ositive **A**irway **P**ressure Assisted)
Pressure-controlled assisted ventilation

APRV Airway **P**ressure **R**elease **V**entilation (optional)
Spontaneous breathing on two pressure levels with long time ranges – independently adjustable.

Special modes:

Apnoea Ventilation
For switching over automatically to volume-controlled mandatory ventilation, if breathing stops.
If apnoea occurs, Evita 2 dura emits an alarm after the preset alarm period (T_{Apnoea}) and starts volume-controlled ventilation.

ILV (optional)
Independent **L**ung **V**entilation
Separate, differentiated, synchronised ventilation with two Evita units, one for each lung.

Diagnostics

Intrinsic PEEP-measurement (optional)
for determining intrinsic PEEP and measuring trapped volume.

Occlusion pressure measurement (optional)
for evaluating breathing drive during spontaneous breathing.

With monitoring for

airway pressure, Paw
expiratory minute volume, MV
inspiratory O_2 concentration, FiO_2
inspiratory breathing gas temperature, T
expiratory CO_2 concentration, $etCO_2$ (optional)
functional O_2 saturation and heart rate (optional)
inspiratory breathing volume, V_{TI}
apnoea time
tachypnoea monitoring to detect rapid, shallow spontaneous breathing

Automatic gas switch-over
In the event of a gas failure, the change-over to another gas is automatic.

* Registered trade mark

Operating Concept

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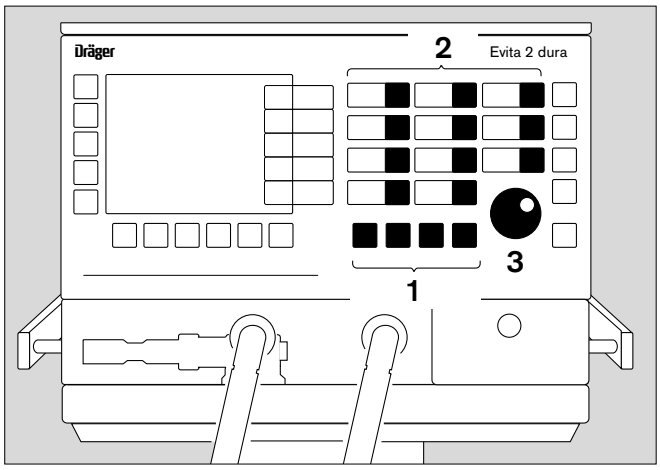
Ventilation Controls



1 Keys for selecting the ventilation modes:
- **IPPV**
- **SIMV**
- **BIPAP**

and
- **other modes**

2 Keys for selecting / setting ventilation parameters:
- Tidal volume **VT**
- Inspiration time **Tinsp**
- Frequency **f**
- Inspiratory flow **Flow**
- Inspiratory pressure **Pinsp**
- Pressure-assisted spontaneous breathing ∆**PASB**
- Positive end-expiratory pressure **PEEP**
- Pressure rise time **Ramp**
- O_2 concentration **O_2**
- Sensitivity **Trigger**

3 Central "turn-and-push" rotary knob for setting the parameters:
To set = turn the rotary knob
To confirm setting = press the rotary knob.

Setting ventilation parameters

2 To set a ventilation parameter = press the corresponding parameter key.
The yellow LED in the key lights up.

3 To set the value of the ventilation parameter = turn the rotary knob. The value is displayed next to the parameter key.

3 To confirm the value = press the rotary knob.
The yellow LED goes out.

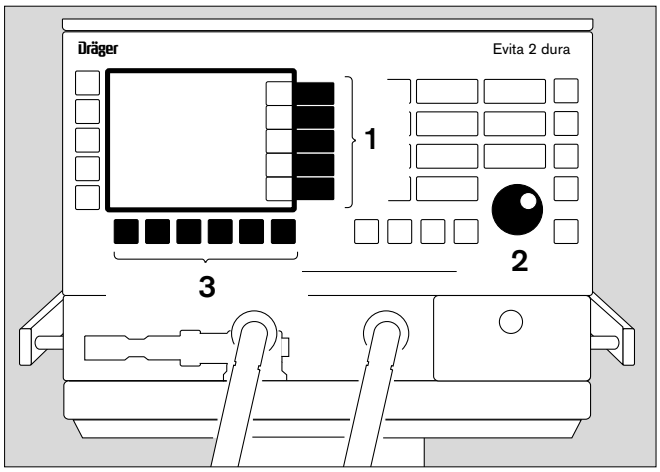
Selecting the ventilation mode

1 Hold down the appropriate key for about 3 seconds
or
press the appropriate key briefly and
confirm = press the rotary knob.

The selected ventilation mode will now be activated.

For detailed instructions on setting the ventilation modes, see page 25.

Screen Operating Controls



1 Menu keys for selecting the menu on the screen.

2 Central "turn-and-push" rotary knob for selecting and setting the options displayed on the screen.

To select/set = turn the rotary knob
To confirm = press the rotary knob.

3 Screen operating keys:

»**Print** « key for manual printer logging,

» ☼/● « key for setting the screen brightness to bright or dark,

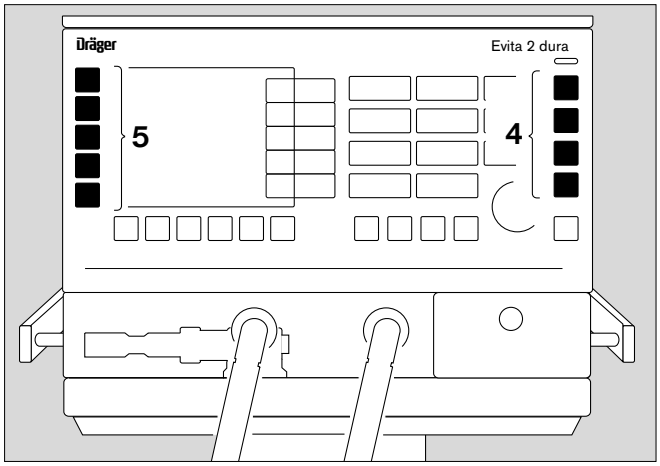
»**Freeze** « key for freezing the curves,

»**Curves** « key for displaying a different pair of curves,

»**Values** 1▭ 2▭« key for displaying a different combination of measured values,

one reserve key for future functions.

Keys for routine and additional functions



4 Frequently used keys for routine functions are positioned on the right-hand side of the front panel:

» 🔕 « key for suppressing the audible alarm tone,

»**Alarm Reset**« key for resetting or acknowledging alarm messages,

» ℹ « key for calling up information and help on the desired setting,

» 🔒 « key for protecting against inadvertent or unauthorised modification of the settings of the ventilation parameters or ventilation modes.

5 Keys for additional functions are positioned on the left-hand side of the front panel:

» « key for switching the medicament nebuliser on / off,

»**O2** **Suction**« key for oxygen enrichment during bronchial suction.

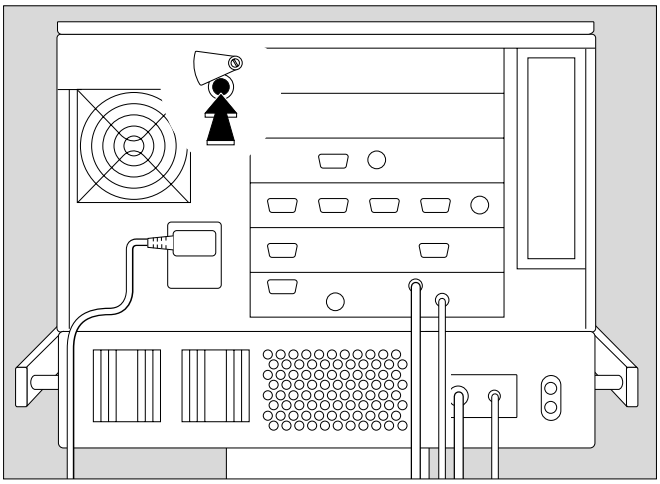
»**Insp. hold**« for manually activated inspiration,

»**Exp. hold**« for extending the expiration time,

one reserve key for future functions.

Power switch

To switch the apparatus on / off.
Located on the back panel, with a covering flap to protect the switch from being switched off inadvertently.



Standby key » ⏻ «

Placed on its own, away from other keys.

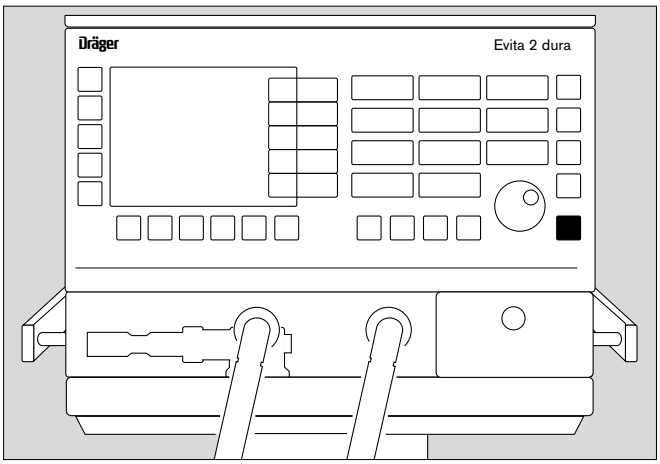
For keeping the apparatus on standby
or
for switching on ventilation.

To switch to standby:

- Press and hold down the » ⏻ « key for at least 3 seconds.

To switch on ventilation:

- Briefly press and release the » ⏻ « key.



Screen Pages

The screen pages consist of two basic structures:

– the main page, displaying all important ventilation characteristics at a glance

and

– the application-specific pages for functions and settings.

Important functions are displayed in the same position in both structures:

– active ventilation mode and patient mode
– alarm, warning and advisory messages
– field for the menu selection keys
– information and help.

Structure of the main page

① Line for the active ventilation mode, patient mode and trigger indicator.

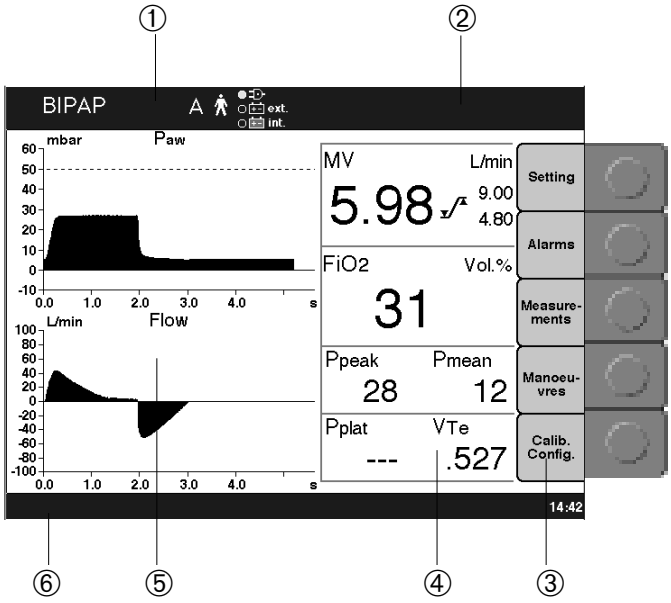
② Bar for alarm, warning and advisory messages

③ Field for menu selection keys

④ Field for measured values

⑤ Field for curves

⑥ Bar for information and help



Structure of the application-specific pages

① Bar for the currently active ventilation mode and patient mode (example: BIPAP)

② Field for displaying the selected menu

③ Field for the menu bar

④ Bar for the alarm, warning and advisory messages

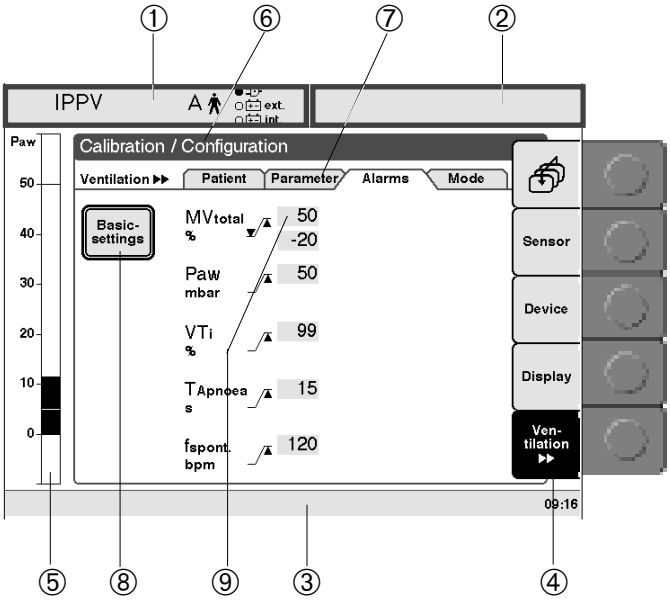
⑤ Field for menu selection keys

⑥ Bar for information and help

⑦ Screen field, selectable with the rotary knob

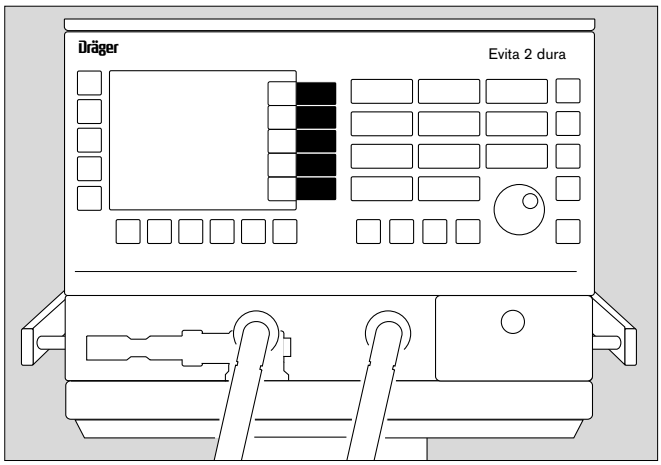
⑧ Screen key, selectable with the rotary knob

⑨ Field for continuous pressure display and monitoring



The menu keys on the right-hand edge of the screen select the screen pages for the following specific application situations:

– **Settings**
– **Alarms**
– **Measurements**
– **Measurement manoeuvre** (optional)
– **Calib./Config.**



»Settings«

– For setting apnoea ventilation.
– For setting intermittent PEEP.

For detailed operating instructions, see "Setting ventilation modes" on page 25 onwards.

»Alarms«

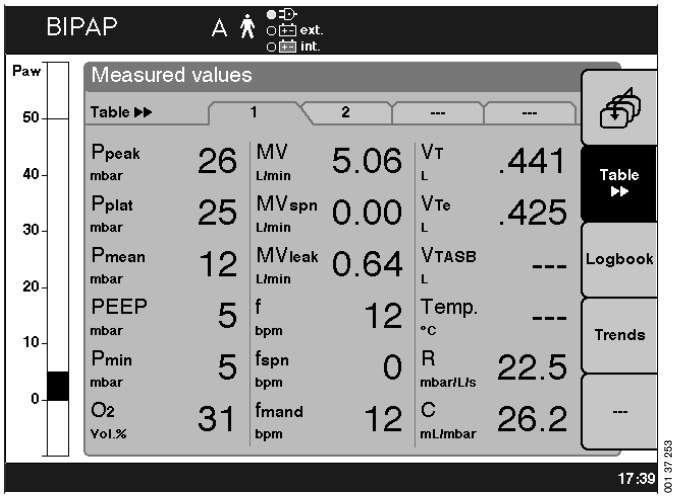
– For displaying the measured values with their alarm limits.
– For setting the alarm limits.

For detailed operating instructions, see "Setting alarm limits" on page 37.

»Measurements«

– For displaying all the measured values in the current ventilation mode.

Press the »**Table ▶▶**« screen key to display more option measured values in »Table 2«.



»Calibration / Configuration«

Sensors

– Calibrating the sensors for O_2 and flow
– Switching the monitoring system on and off

Device

– Setting the volume of the acoustic alarm
– Setting the screen contrast
– Setting the date and time
– Selecting language and measurement units
– Setting the external interfaces

Display

– Selecting 2 x 6 measured values from the main page
– Selecting 2 x 2 curves from the main page

Ventilation

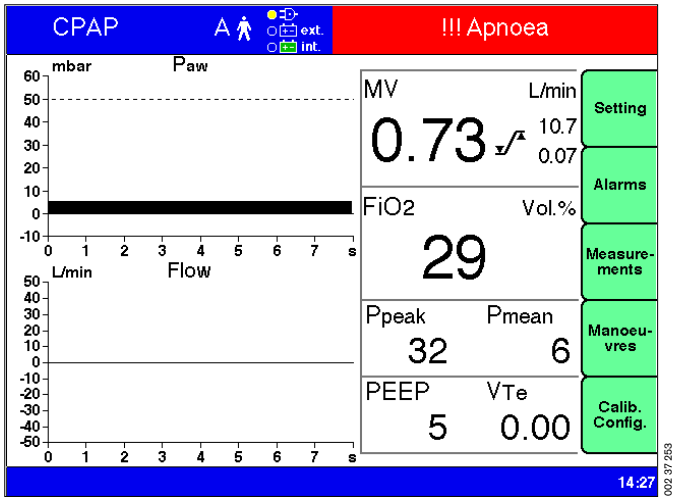
– Patient mode
– Ventilation mode
– Ventilation parameters
– Alarm limits.

Colour screen

For differentiating various items of information on the screen.

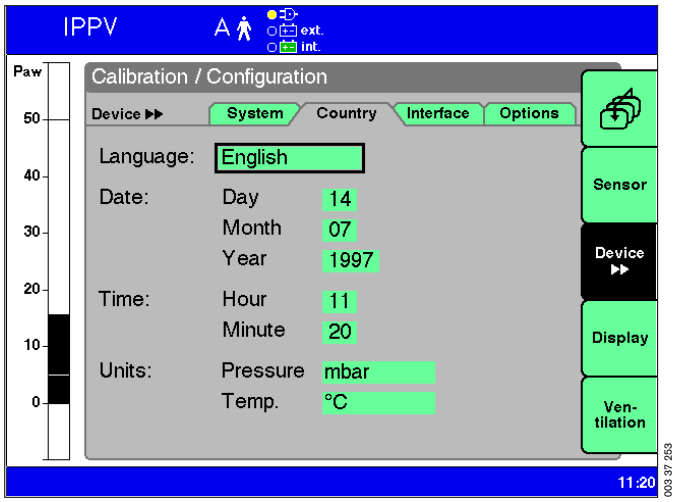
For messages:
Red = Alarm
Yellow = Caution or advisory message
Blue = Alarm is no longer active

Example: "!!! Apnoea" alarm



For menu buttons:
Green = Can be selected
Black = Has been selected

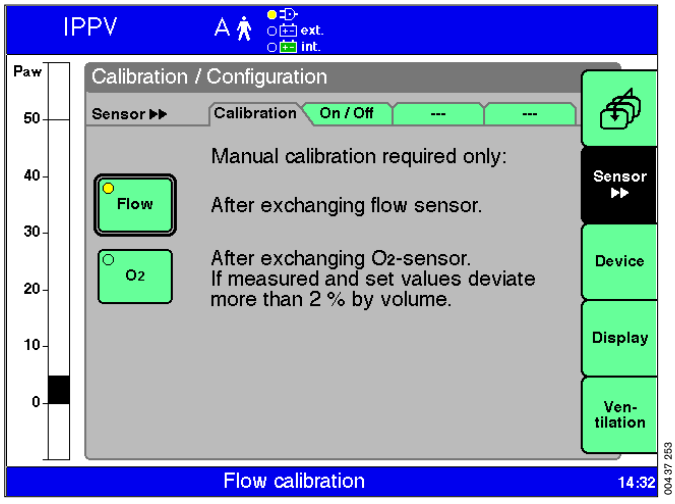
Example: Menu button »**Device ▶▶**«



For screen keys:
Green "LED" in the screen key = function not active

Yellow "LED" in the screen key = function active

Example: Screen key »**Flow**« – function active



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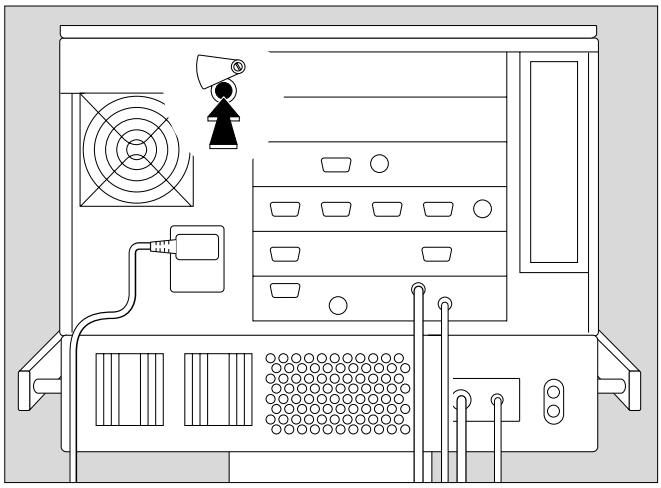
Starting up

Switching on

- Push in power switch on back panel until it clicks into place = ON.
  The flap comes down over the switch to prevent it being inadvertently switched off.



Evita 2 dura runs a self-test.

- Wait until the 10-second test phase is complete.

Evita 2 dura always begins ventilation with the start-up values marked by an arrow on the on-screen knobs. To select these start-up values, please refer to pages 62 onwards.
After power cuts and after standby mode, the settings valid immediately before the interruption of operation remain in use.

Patient mode

After switching on, Evita 2 dura displays a choice of patient modes:

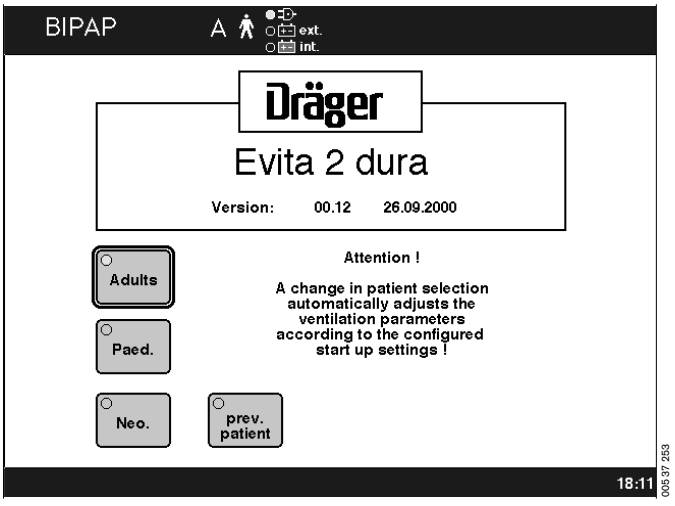
– »**Adults**« = adult patients
– »**Paed.**« = children
– »**Neo.**« = neonates
  (when using the "NeoFlow" option)
– »**prev. patient**« = previous patient

Example:

Adult ventilation

With this information, Evita 2 dura defines the adjustment ranges and the start-up values of the ventilation parameters.

The starting procedure, with selection of the patient mode, can be configured by the user, see Configuration on page 55 onwards.



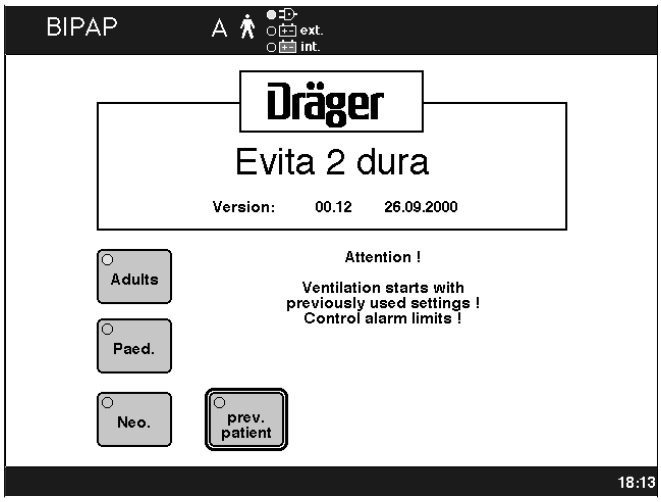
The screen key »**prev. patient**« can be used to restore the specific patient settings, including alarm limits and monitoring status, effective before switching off the device.

Example:

Previous patient

The previous modes are displayed in the status line:

– Previous ventilation mode (example: IPPV)
– Previous patient mode (A = Adult)
– Previous application mode – tube or mask for optional NIV (example: NIV)



The key »**prev. patient**« is not displayed by Evita 2 dura following a loss of data or removal of a previously used option (e.g. NeoFlow), thus preventing restoration of the previous setting.

Selecting the patient mode

Either:

- Select the »**Adults**« key
  or
  the »**Paed.**« key
  or
  the »**Neo.**« key (NeoFlow option) = turn rotary knob.
- Confirm = press rotary knob.

or:

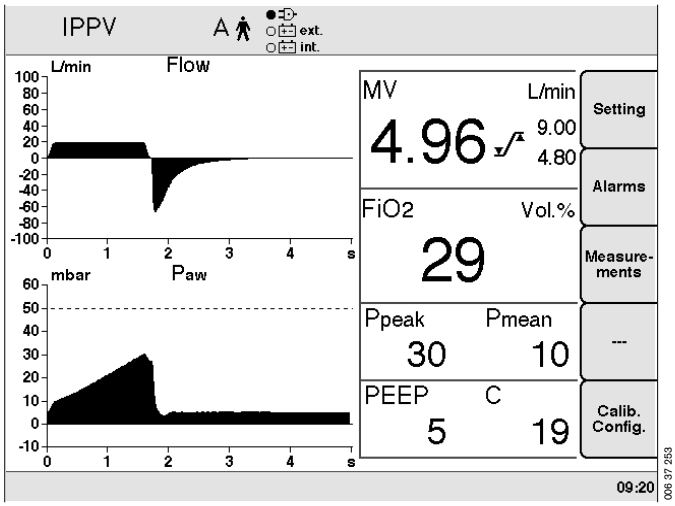
- Select the key »**prev. patient**« = turn rotary knob.
- Confirm = press rotary knob.

Starting ventilation

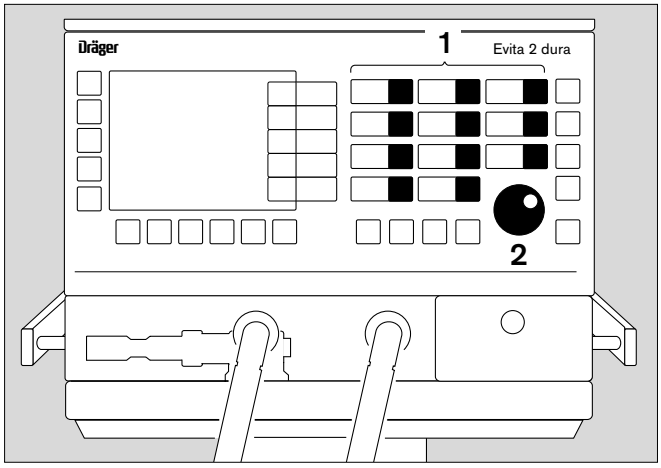
Evita 2 dura starts ventilation with the ventilation mode configured by the user and with the specific start settings for the patient or with the settings valid before the machine was last switched off.
To select other start-up settings, see page 63.
If no selection is made or if the rotary knob is not pressed to confirm the new settings, the apparatus automatically starts ventilation after 30 seconds with the last selected patient mode and ventilation mode and the associated ventilation parameters.

The main page is displayed on the Evita 2 dura screen.

The user can check and correct the settings in the display fields next to the parameter keys.



Setting Ventilation Modes



To set the ventilation parameters:

1 Press the appropriate ventilation mode key. The yellow LED in the key will light up.

2 Set the desired value = turn the rotary knob. Confirm value = press the rotary knob. The yellow LED will go out.

If the setting is at the upper or lower limit of the adjustment range for a parameter, the LED in the relevant key will start flashing

2 Acknowledge = press the rotary knob.

If you fail to confirm/acknowledge the new settings within 30 seconds, the previous settings will remain operative.

Setting parameters for another ventilation mode

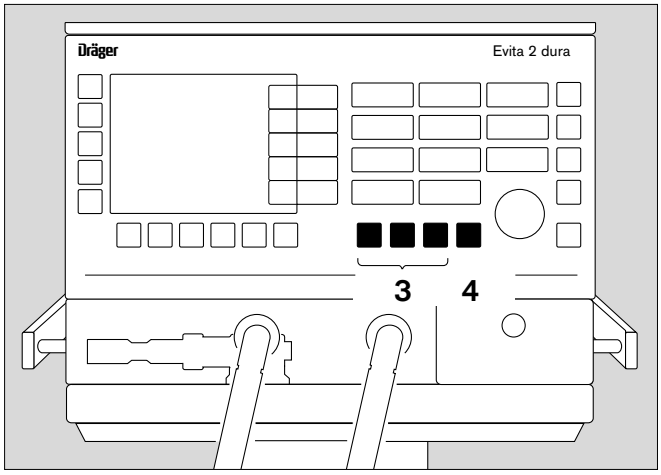
1 Press the relevant ventilation mode key briefly. Its LED will flash.

In the block of parameter keys, the keys for the parameters relevant to the new ventilation mode will start flashing.

Set the new ventilation parameters:

1 Press the relevant key: its LED will stop flashing and remain constantly lit.

2 Set the desired value = turn the rotary knob. Confirm value = press the rotary knob. The yellow LED will go out.



To activate the ventilation mode:

3 Ventilation mode keys:
- **IPPV**
- **SIMV**
- **BIPAP**

and
- **other modes.**

4 »**Other Modes**« key for other ventilation modes that are set on the screen. Factory-set default: CPAP/ASB.

- Hold down the relevant key for 3 seconds, or
- Briefly press and release the relevant key and press the rotary knob.

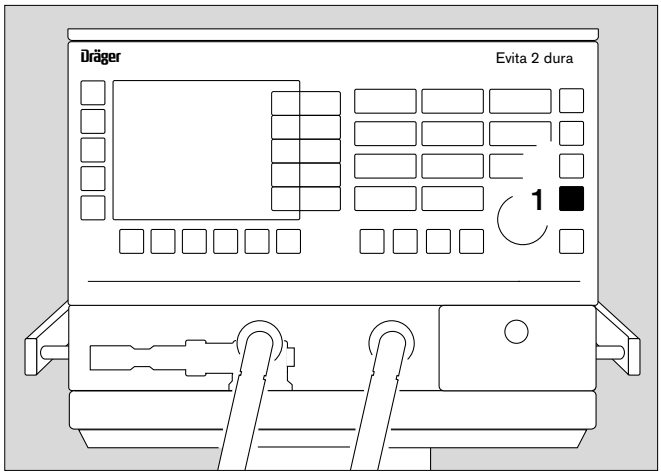
The selected ventilation mode will now be active.

To prevent settings being changed inadvertently

1 Press the »🔓« Its yellow LED will light up. The parameter keys and ventilation mode keys will be protected against inadvertent setting.

Before setting a new value:

1 Press the »🔓« key. The yellow LED will go out.

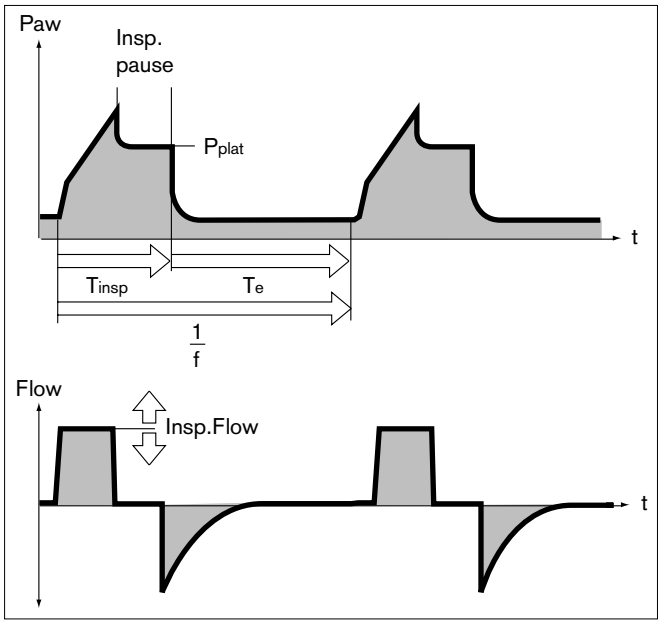


IPPV

Intermittent **P**ositive **P**ressure **V**entilation

Volume-controlled ventilation with a fixed mandatory minute volume MV, set with the tidal volume V_T and frequency f.

For patients unable to breathe spontaneously.



- Set ventilation pattern for IPPV via the keys for the ventilation parameters:

Tidal volume »**V_T**«
Insp.Flow »**Flow**«

Frequency »**f**«
Inspiration time »**T_{insp}**«

O_2 concentration »**O_2**«
Positive end-expiratory pressure »**PEEP**«

IPPV can be supplemented by the following ventilation parameters:

Trigger (IPPV Assist) – for synchronising mandatory ventilation with attempted spontaneous breathing by the patient.
By activating the trigger and setting the trigger sensitivity, the mandatory ventilator strokes are synchronised with the patient's spontaneous breathing attempts.

The trigger can be switched off if synchronisation with the patient's spontaneous breathing attempts is not required.

To activate / set:

- Press ventilation parameter key »**Trigger**«.
- Set value = turn the rotary knob,
  Confirm value = press the rotary knob.

To deactivate:

- Set a value less than 0.3 or above 15 L/min.
  The display will show: **– – –**

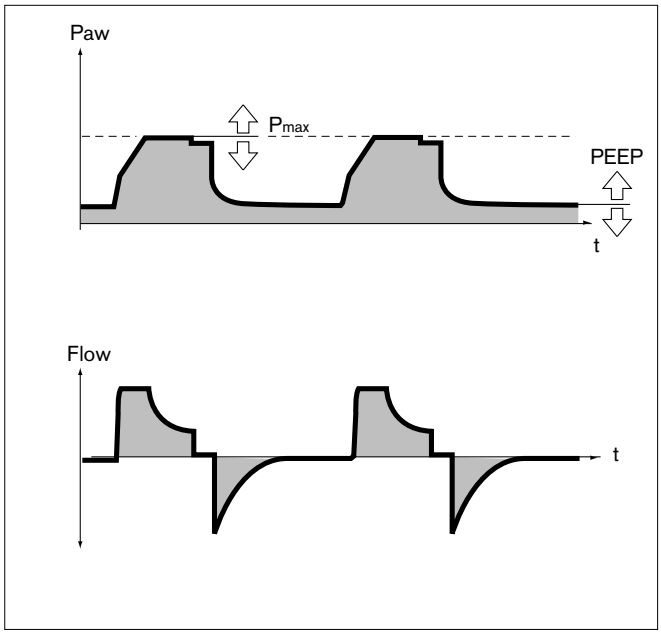
Sigh – to prevent atelectasis.
Atelectasis can be prevented by activating the Sigh function and setting the sigh in the form of an intermittent PEEP.
When the Sigh function is activated, the end-expiratory pressure is increased by the set intermittent PEEP for 2 ventilation strokes every 3 minutes.

Pmax

IPPV can be supplemented by the ventilation parameter Pmax.

- Activate »Pressure limit Pmax«, see page 64.
- Set value Pmax via the key for the ventilation parameter »**Pinsp**«.

Pressure limited ventilation PLV* – for manually limiting pressure peaks to the pressure limit Pmax.
The tidal volume remains constant as long as the pressure curve continues to show a short pressure plateau and the flow curve shows a brief pause in the flow between inspiration and expiration.
Volume monitoring is constantly active. If the set tidal volume V_T can no longer be applied, the alarm "Volume not constant" is automatically generated.



When changing from IPPV to a pressure-controlled ventilation mode, the value of Pmax is adopted but is limited to 50 mbar (the display for the »**Pinsp**« ventilation parameter flashes).

- Confirm value = press the rotary knob
  or
  set a higher value.

* For a detailed description of PLV, see page 110.

SIMV, SIMV / ASB

Synchronized **I**ntermittent **M**andatory **V**entilation*
Assisted **S**pontaneous **B**reathing**

Fixed mandatory minute volume MV, set with the tidal volume V_T and frequency f. The patient can breathe spontaneously between the mandatory ventilation strokes, thereby contributing to the overall minute volume. Spontaneous breathing can be assisted by ASB.

For patients with insufficient spontaneous breathing or patients being weaned from artificial ventilation by progressive reduction of the mandatory proportion of the total minute volume.

The frequency can be reduced to 0 during the weaning process. The machine automatically changes to ventilation mode CPAP or CPAP/ASB. This ventilation mode is also displayed.

Set the ventilation pattern for SIMV via the keys for the ventilation parameters:

Tidal volume »**VT**«
Insp.Flow »**Flow**«

Frequency »**f**«
At f = 0/min, the ventilator switches to CPAP mode.

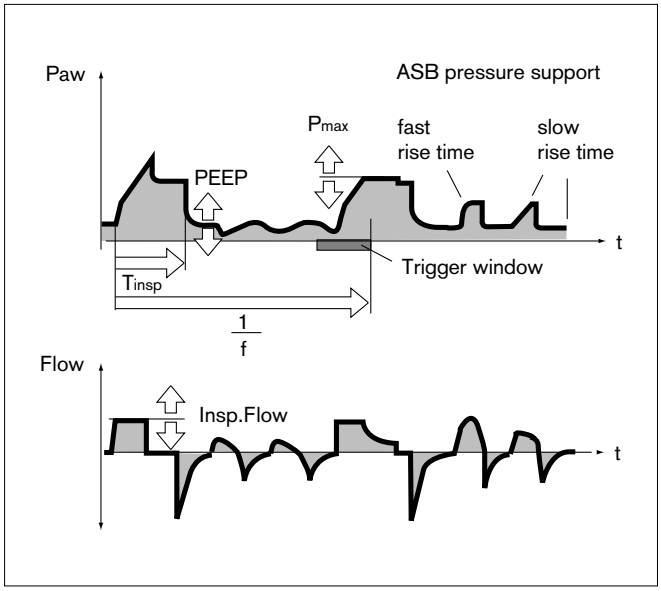
Inspiration time »**Tinsp**«

Sensitivity »**Trigger**«

O_2 concentration »**O2**«
Positive end-expiratory pressure »**PEEP**«

Additionally for SIMV / ASB:

Pressure support »**PASB**«
Pressure rise time »**Ramp**«

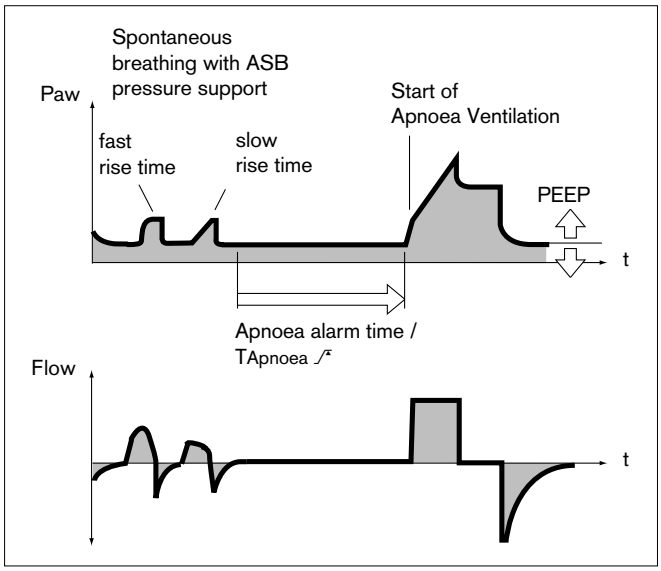


SIMV, SIMV / ASB can be supplemented with the following ventilation parameters:

Apnoea ventilation – for automatic switchover to volume-controlled mandatory ventilation if the patient stops breathing.
If breathing stops, Evita 2 dura activates an alarm after the set alarm time (T_{Apnoea}) and starts volume-controlled ventilation with the set ventilation parameters:
Frequency »**fApnoea**«
Tidal volume »**VTApnoea**«

The patient can breathe spontaneously during apnoea ventilation. The apnoea ventilation frequency remains constant.

Set apnoea ventilation, see page 36.



* For a detailed description of SIMV, see page 112.
** For a detailed description of ASB, see page 113.

Pmax

SIMV, SIMV / ASB can be supplemented with the ventilation parameter Pmax

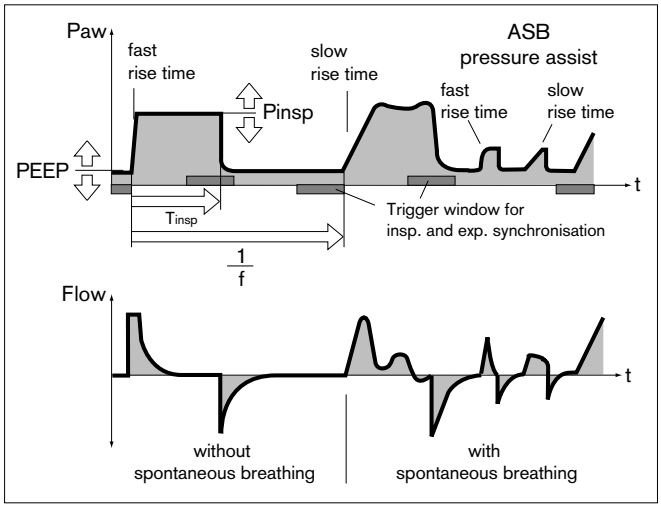
- Activate »Pmax pressure limit«, see page 64.
- Set the value of Pmax with the »**Pinsp.**«

Pressure limited ventilation PLV* – for manually limiting pressure peaks using the Pmax pressure limit.
The tidal volume remains constant as long as the pressure curve continues to show a short plateau, and the flow curve shows a brief pause in the flow between inspiration and expiration.
Volume monitoring is constantly active. If the set tidal volume VT can no longer be applied, the alarm "Volume not constant" is automatically generated.

* For a detailed description of PLV, see page 110.

BIPAP, BIPAP / ASB

Biphasic **P**ositive **A**irway **P**ressure
Assisted **S**pontaneous **B**reathing



Pressure-controlled ventilation combined with free spontaneous breathing during the complete breathing cycle, supported by adjustable additional pressure at CPAP level.
The mandatory proportion of the total minute volume MV is set by means of the inspiration pressure Pinsp, PEEP and frequency f.

Adaptable to a wide range of patients, from those unable to breathe spontaneously at all to those breathing spontaneously before extubation. Suitable for weaning patients from artificial ventilation by progressively reducing the mandatory fraction of the minute volume MV and by reducing the additional artificial pressure support PASB.

The frequency can be reduced to 0 during the weaning process. The machine automatically changes to ventilation mode CPAP or CPAP/ASB. This ventilation mode is also displayed.

Set the ventilation pattern for BIPAP via the keys for the ventilation parameters:

Inspiration pressure »**Pinsp**«
If Pinsp is set to the same value as PEEP, the machine changes over to CPAP mode.

Frequency »**f**«
If f = 0/min, the apparatus switches over to CPAP mode.

Inspiration time »**Tinsp**«

Sensitivity »**Trigger**«

O_2 concentration »**O_2**«
Positive end-expiratory pressure »**PEEP**«

Additionally for BIPAP/ASB:

Pressure support »**PASB**«
Pressure rise time »**Ramp**«

BIPAP, BIPAP/ASB can be supplemented with the following ventilation parameters:

Apnoea ventilation – for automatic switchover to volume-controlled mandatory ventilation if the patient stops breathing.
If the patient stops breathing, Evita 2 dura activates an alarm after the set alarm time (TApnoea) and starts volume-controlled ventilation with the set ventilation parameters:
Frequency »**fApnoea**«
Tidal volume »**VTApnoea**«

The patient can breathe spontaneously during apnoea ventilation. The apnoea ventilation frequency remains constant.

Set apnoea ventilation, see page 36.

BIPAPAssist

Biphasic **P**ositive **A**irway **P**ressure Assisted

pressure-controlled, assisted ventilation

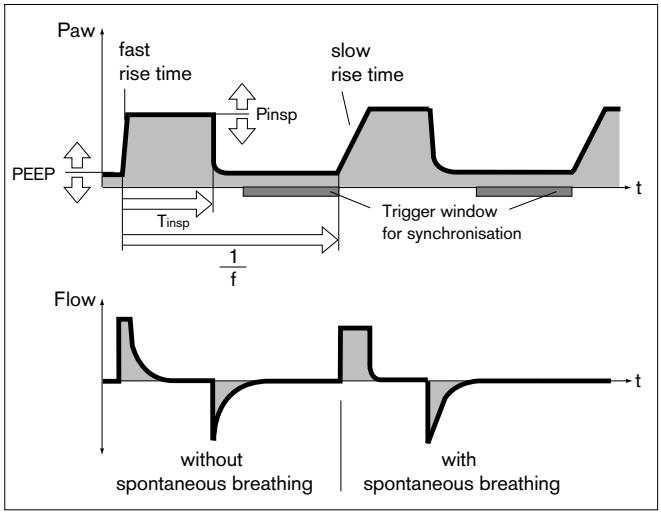
The inspiratory strokes are the same as for BIPAP, but the changeover from Pinsp to PEEP is not synchronised with expiration by the patient.
The patient can breathe spontaneously at PEEP level through the entire ventilation process.

Every spontaneous breathing activity by the patient triggers a synchronised inspiratory stroke.

A non-synchronised inspiratory stroke is started by the device at the latest upon expiry of the time »f«.

For all patients, from those unable to breathe spontaneously to those breathing spontaneously before being weaned off the ventilator.

The set values for the relevant ventilation parameters are displayed alongside the keys for the ventilation parameters.



- Set the ventilation pattern for BIPAPAssist via the keys for the ventilation parameters:

  Inspiratory pressure »**Pinsp**«

  Frequency »**f**«
  Inspiration time »**Tinsp**«

  O_2 concentration »**O_2**«
  Positive end-expiratory pressure »**PEEP**«

  Pressure rise time » ⩘ «

  Sensitivity »**Trigger**«
  Absolute inspiratory pressure »**Pinsp**«

To activate:

- Press menu button **»other modes«**.

When BIPAPAssist has been selected in the menu with the cursor:

- Hold the menu button **»other modes«** for approx. 3 seconds,

or:

- Press the rotary knob.

Otherwise:
- Select BIPAPAssist = turn rotary knob, activate = press rotary knob.

The "LED" in the screen key **»BIPAPAssist«** changes from green to yellow. Ventilation mode BIPAPAssist is now active and displayed in the status line.

CPAP, CPAP / ASB

Continuous **P**ositive **A**irway **P**ressure
Assisted **S**pontaneous **B**reathing

Spontaneous breathing at a raised pressure level, to increase the functional residual capacity FRC. Spontaneous breathing can be assisted with additional pressure by ASB.

For patients breathing spontaneously.

- Set the ventilation pattern for CPAP via the keys for the ventilation parameters:

  O_2 concentration »**O_2**«
  Positive end-expiratory pressure »**PEEP**«

  Additionally, for CPAP/ASB:

  Pressure support »**P_{ASB}**«
  Pressure rise time »**Ramp**«

  Sensitivity »**Trigger**«

To activate:
- Press menu button **»other modes«**.

When CPAP/ASB has been selected in the menu with the cursor:
- Hold the menu button **»other modes«** for approx. 3 seconds,

or:
- Press the rotary knob.

Otherwise:
- Select CPAP/ASB = turn rotary knob, activate = press rotary knob.

The "LED" in the screen key **»CPAP/ASB«** changes from green to yellow. Ventilation mode CPAP/ASB is now active and displayed in the status line.

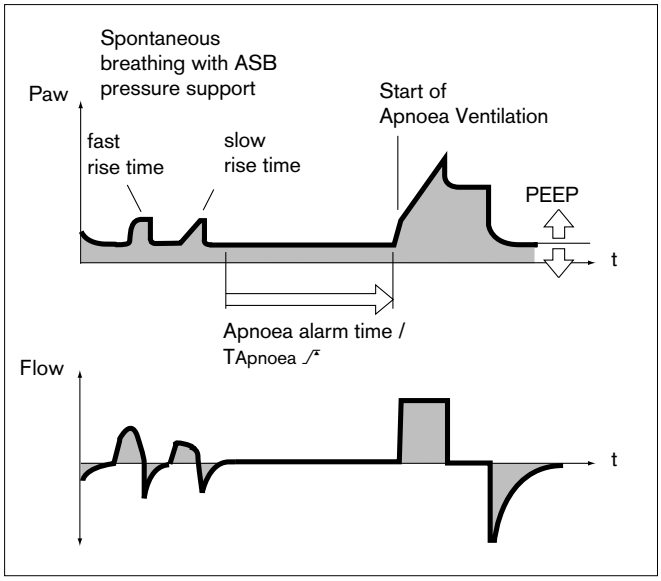
CPAP/ASB can also be activated when frequency f = 0 in SIMV or BIPAP.

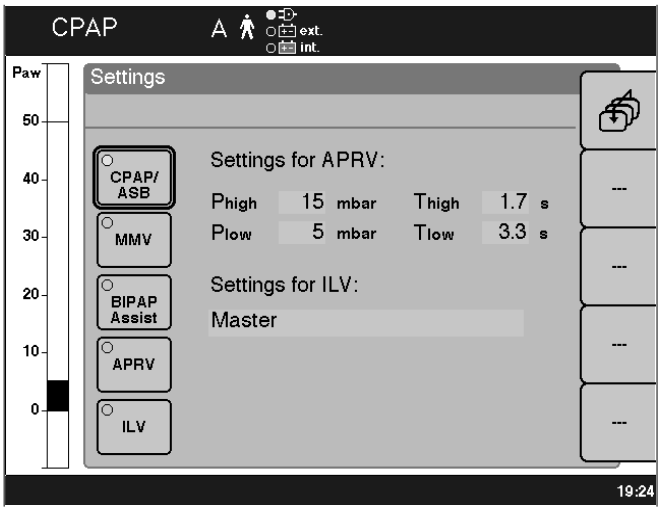
CPAP, CPAP/ASB can be expanded with the following ventilation parameters:

Trigger – for synchronising ventilation with attempted spontaneous breathing by the patient.
By activating the trigger and setting the trigger sensitivity, the assisting ventilator strokes are synchronised with the patient's own spontaneous breathing attempts.

Apnoea ventilation – for automatic switchover to volume-controlled mandatory ventilation if the patient stops breathing.
If the patient stops breathing, Evita 2 dura activates an alarm after the set alarm time (T_{Apnoea}) and starts volume-controlled ventilation with the set ventilation parameters:
Frequency »**f_{Apnoea}**«
Tidal volume »**$V_{TApnoea}$**«
The patient can breathe spontaneously during apnoea ventilation. The apnoea ventilation frequency remains constant.

To set apnoea ventilation, see page 36.



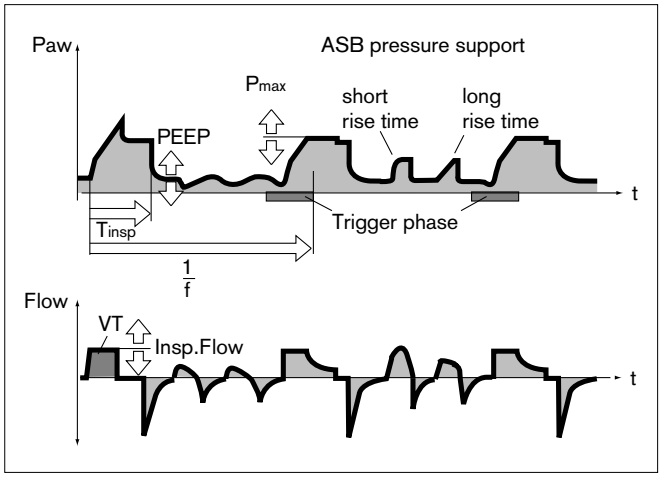


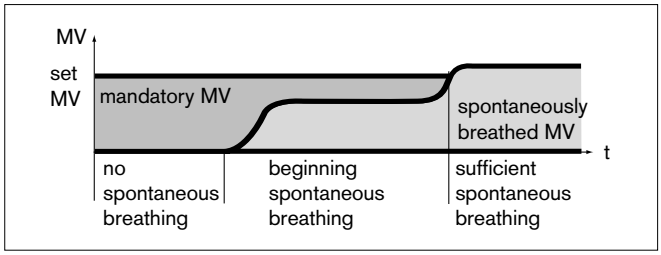
MMV, MMV / ASB

Mandatory **M**inute Volume **V**entilation*
Assisted **S**pontaneous **B**reathing

The overall minute volume is preset to a mandatory level, which can be adjusted by means of the tidal volume V_T and frequency f.
The patient can breathe spontaneously, thereby contributing a proportion of the total minute volume. The difference between the spontaneously breathed minute volume and the set minute volume is covered by the mandatory ventilation strokes. Spontaneous breathing can be assisted by the ASB pressure support.

This mode is intended for patients being weaned off the ventilator by progressively reducing the mandatory proportion of the total minute volume.





- Set the pattern of ventilation for MMV with the ventilation parameters:

  Tidal volume »**V_T**«
  Insp.Flow »**Flow**«

  Frequency »**f**«
  Inspiration time »**T_{insp}**«

  Sensitivity »**Trigger**«

  O_2 concentration »**O_2**«
  Positive end-expiratory pressure »**PEEP**«

  Additionally, for MMV / ASB:

  Pressure assist »**P_{ASB}**«
  Pressure rise time »**Ramp**«

To activate:

- Press menu button **»other modes«**.

When MMV has been selected in the menu with the cursor:

- Hold the menu button **»other modes«** for approx. 3 seconds,

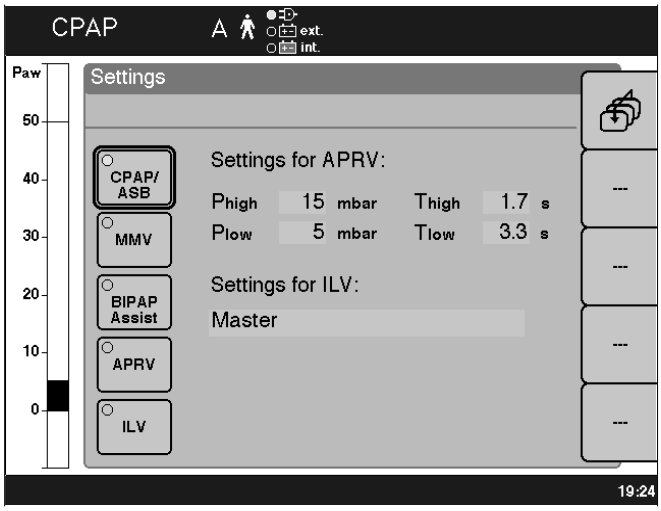
or:

- Press the rotary knob.

Otherwise:

- Select MMV = turn rotary knob,
  activate = press rotary knob.

The "LED" in the screen key »MMV« changes from green to yellow. Ventilation mode MMV is now active and displayed in the status line.



For a detailed description of MMV, see page 116.

Pmax

MMV, MMV/ASB can be supplemented with the ventilation parameter Pmax.

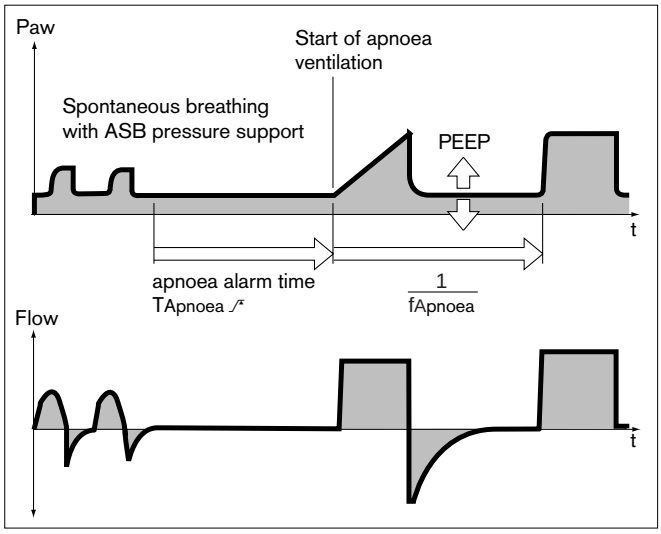
- To activate »Pmax pressure limit«, see page 64.

Pressure limited ventilation PLV* – for manually limiting pressure peaks using the Pmax pressure limit.
The tidal volume remains constant as long as the pressure curve continues to show a short plateau, and the flow curve shows a brief pause in the flow between inspiration and expiration.
Volume monitoring is constantly active. If the set tidal volume V_T can no longer be applied, the alarm "Volume not constant" is automatically generated.

* For a detailed description of PLV, see page 110.

Apnoea ventilation

For automatic switch-over to volume-controlled mandatory ventilation if the patient stops breathing.
It can be switched on in the ventilation modes SIMV, BIPAP, CPAP, APRV.
Evita 2 dura emits an apnoea alarm if during the set alarm period »**TApnoea**« no expiration flow is measured or insufficient inspiratory gas is delivered.
If breathing stops, Evita 2 dura emits an alarm after the set alarm time (**TApnoea** ⎍) and starts volume-controlled ventilation with the set ventilation parameters:
Frequency »**fApnoea**«
Tidal volume »**VTApnoea**«



The ventilation parameters »**O2**« and »**PEEP**« correspond to the settings effective at the time.
The inspiration time for apnoea ventilation is determined from the set apnoea frequency »**fApnoea**« and a fixed I:E ratio of 1:2.

As in SIMV, the patient can breathe spontaneously during apnoea ventilation and the mandatory ventilation strokes will be synchronised with the patient's spontaneous breathing. The apnoea ventilation frequency remains constant.

To set apnoea ventilation:

- Press menu button »**Settings**«.

Display:

- Select screen key »**Apnoea vent.**« = turn rotary knob.
  Switch on apnoea ventilation = press rotary knob.
  The "LED" in the screen key changes from green to yellow = apnoea ventilation is on.
- Select field »**VTApnoea**« = turn rotary knob,
  activate = press rotary knob.
- Set values = turn rotary knob,
  confirm = press rotary knob.
- Select, set and confirm »**fApnoea**« accordingly.

To terminate apnoea ventilation:

- Press **»Alarm Reset«** key. The machine will continue operating in its previous ventilation mode.

  or

- Select another ventilation mode.

See page 65 for configuration of the apnoea ventilation status when starting the machine.

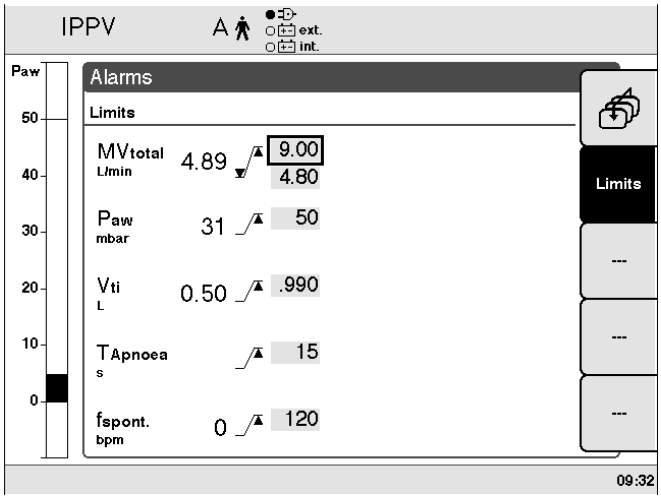
Setting Alarm Limits

- Press the »**Alarms**« menu key.

  Example display: »**Limits**«

  This page displays all the alarm limits that can be set/adjusted.

  ↓ = lower alarm limit
  ↑ = upper alarm limit



Example: Setting the upper alarm limit for f_{spont}.

- Select the f_{spont} screen field with the cursor = turn the rotary knob.
  Confirm = press the rotary knob.
- Set the desired value = turn the rotary knob.
  Confirm = press the rotary knob.

The lower alarm limit does not have to be set for the airway pressure Paw, because it is automatically coupled with the PEEP setting.

The alarm limits do not have to be set for the O_2 concentration. These limits are automatically coupled to the O_2 concentration setting.

Lower alarm limit:
for settings up to 60 Vol.% O_2: setting –4 Vol.% O_2
for settings from 60 to 100 Vol.% O_2: setting –6 Vol.% O_2

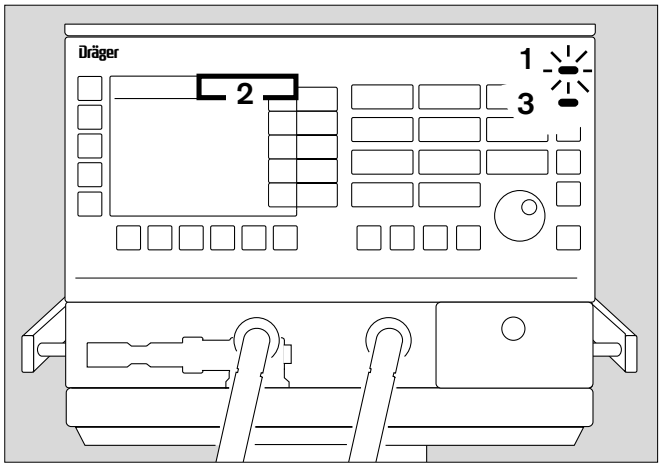
Upper alarm limit:
for settings up to 60 Vol.% O_2: setting +4 Vol.% O_2
for settings from 60 to 100 Vol.% O_2: setting +6 Vol.% O_2

Adjustment ranges

Ventilation Parameter		Adjustment Range	Factory setting	Hospital-specific setting*
MV_{total} ↓↑	L/min	0.1 to 41 0.01 to 40	MV_{total} +50 % MV_{total} –20 %	....
Paw ↑	mbar	10 to 100 no lower alarm limit	50	....
V_{Ti} ↑	L	0.021 to 4.0 no lower alarm limit	V_{Ti} + 100 %	....
T_{Apnoea} ↑	s	5 to 60 no lower alarm limit	15	....
f_{spont} ↑	1/min	5 to 120 no lower alarm limit	50	....

* The hospital-specific settings for your hospital can be entered in the table.

In the Event of an Alarm



1 the red or yellow LED flashes.

2 The alarm message is displayed in the right-hand corner of the top line of the screen.

Evita 2 dura assesses the alarm message according to its priority, marks the text with exclamation marks and generates the various alarm tone sequences.

Warning = top priority message

1 The red LED flashes.
Warning messages are marked with three exclamation marks.

Example: **!!! Apnoea**

Evita 2 dura generates a five-tone sequence that is sounded twice and repeated every 7 seconds.

Caution = medium priority message

3 The yellow LED flashes.
Caution messages are marked with two exclamation marks.

Example: **!! Check settings**

Evita 2 dura generates a 3-tone sequence that is repeated every 20 seconds.

Advisory = low priority message

3 The yellow LED lights up and remains constantly lit.
Caution messages are marked with one exclamation mark.

Example: **! Malfunction fan**

Evita 2 dura generates a 2-tone sequence that sounds only once.

If the loudspeaker for audible alarms fails on account of a defect, an auxiliary signal will sound continuously.
This continuous tone also serves as power failure alarm, see page 92, if power is interrupted while the ventilator is in use.

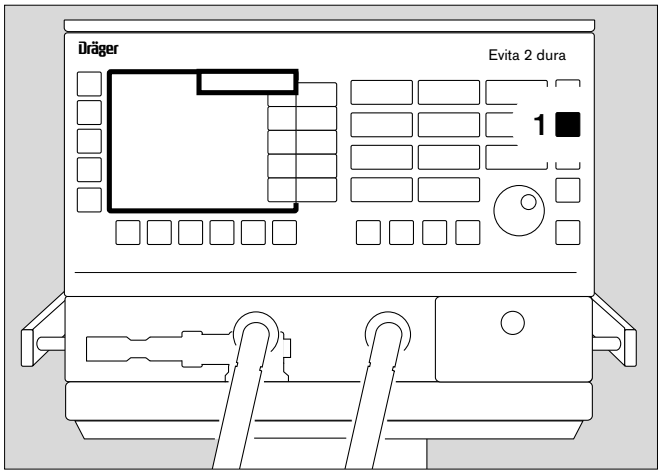
To remedy the faults, please refer to the "Fault – Cause – Remedy" section starting on page 72.

Once the fault has been remedied, the audible alarm is switched off.
Caution messages (!!) and advisory messages (!) disappear automatically.

Alarm messages (!!!) are then displayed in the colour of the status line and must be acknowledged:

1 Press the »**Alarm Reset**« key.

The message is erased from the screen.



Suppressing the audible alarm

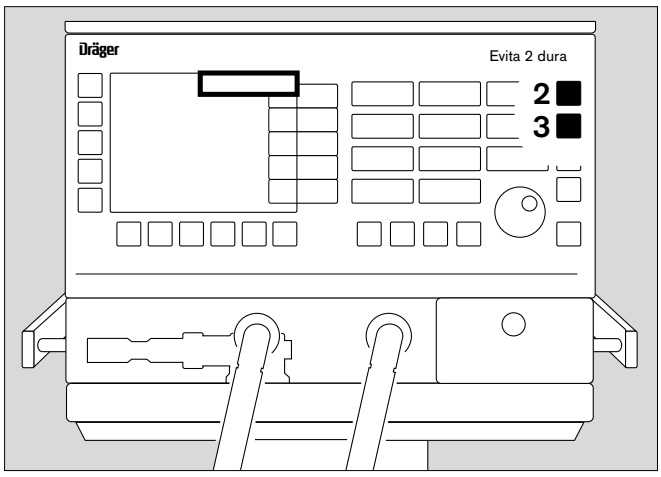
for max. 2 minutes:

2 Press the » 🔔 « key. Its yellow indicator LED lights up, and the alarm tone will be muted for 2 minutes.
If the fault that triggered the alarm is still not remedied, the audible alarm starts up again after this period.

If you wish to reactivate the audible alarm before the end of the 2-minute muting period:

2 Press the » 🔔 « key again. The yellow LED will now go out. The message remains on the screen.

3 Alarms which can be acknowledged via Alarm Reset must be acknowledged via the »**Alarm Reset**« key, see "Fault – Cause – Remedy", page 72.



Information ℹ

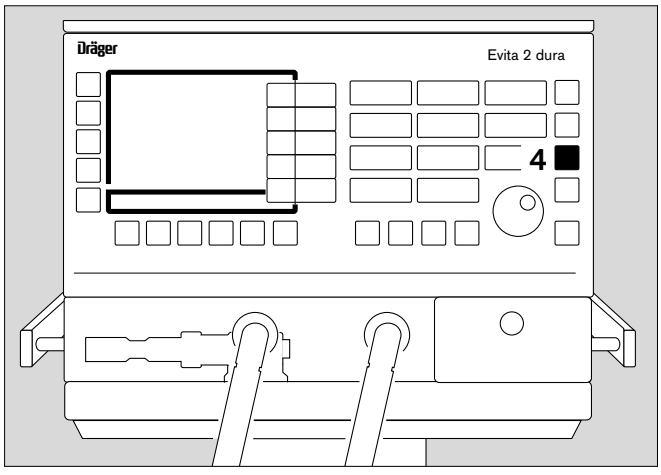
– For help with system operation.

– For help with troubleshooting.

4 Press the » ℹ « key: the required information is displayed in the bottom line of the screen.

To erase the message:

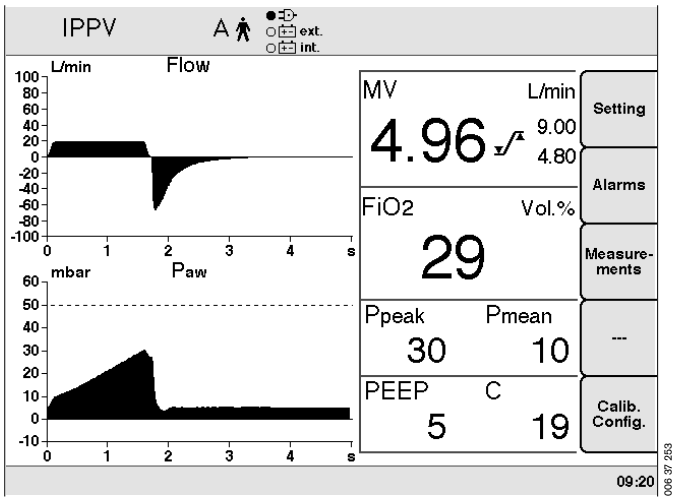
4 Press the » ℹ « key again.



Displaying Curves and Measured Values

In the main page

A set of six selectable measured values is displayed in the right-hand field, and two selectable curves in the left-hand field.



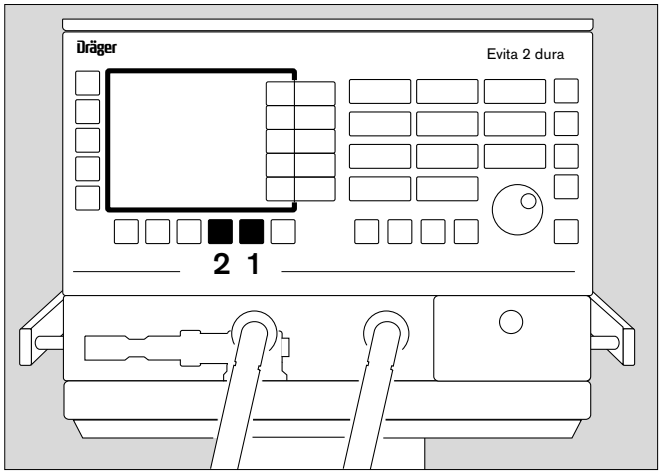
To select a second group of 6 measured values:

1 Press the »**Values** 1▭ 2▭« key.

To select another pair of curves:

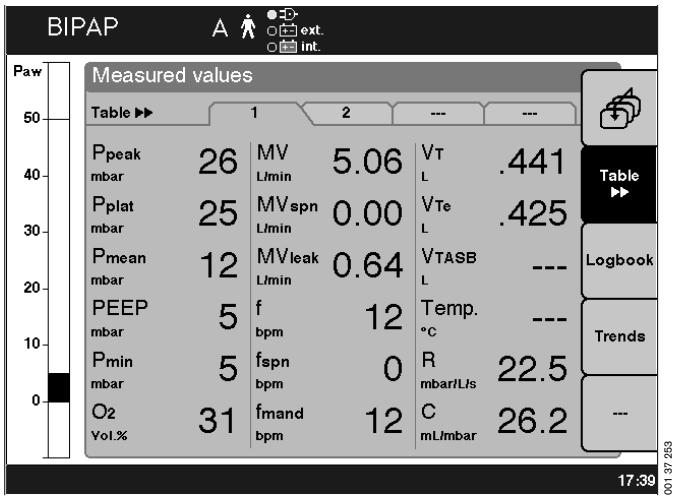
2 Press the »**Curves** ⬑⬏ « key.

Measured values and curves can be selected, see "Combine displayed measured values", page 59 and "Combine displayed curves", page 61.



In the other screen pages, these curves and measured values are not displayed. The airway pressure is therefore continuously indicated by means of an analogue vertical bar display on the left-hand side of the screen.

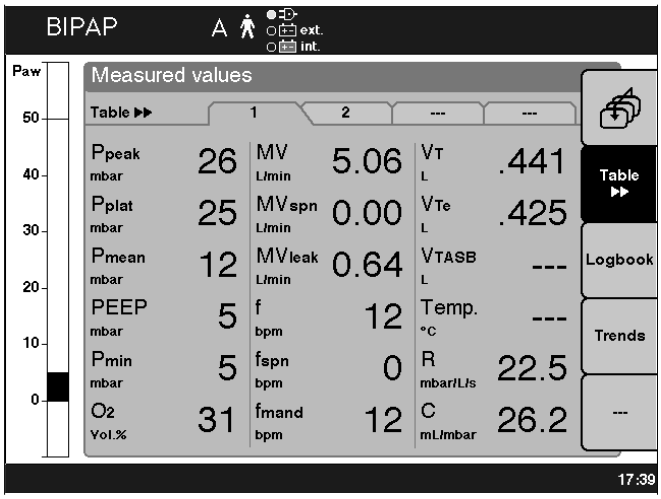
Example: screen page "Measured values 1"



Display measured values

- Press menu button **»Measured values«**.

Display example: **»Table 1«**

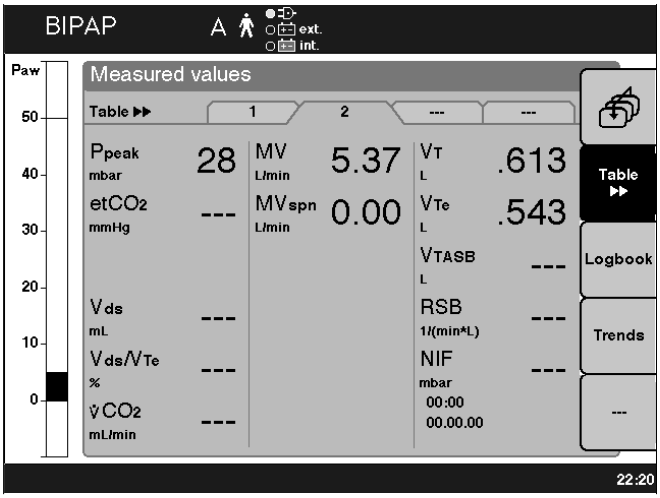


Evita 2 dura displays the measured values and their units of measure in the form of a table. The menu **»Table 1«** is displayed with all standard available measured values.

The measured value MV_{leak} represents the leakage in L/min and is determined by Evita 2 dura by comparing the applied inspiratory minute volume with the measured expiratory minute volume.
The measured value MV_{leak} is used by Evita 2 dura for automatic correction of the applied tidal volume V_{Ti} and the flow and volume curves. This presupposes that leakage compensation has been activated, see page 66. For safety reasons, the measured values for the minute volume are not corrected.

To display the measured values of add-on features (e.g. "Evita 2 dura CapnoPlus"):

- Select the **»Table 2«** menu with the **»Table ▶▶«** menu key.
  Functional extensions of measured values, e.g. CapnoPlus CO_2 monitoring, are displayed in further measured value tables.



The following are optionally displayed (upgrade SW4.n plus):

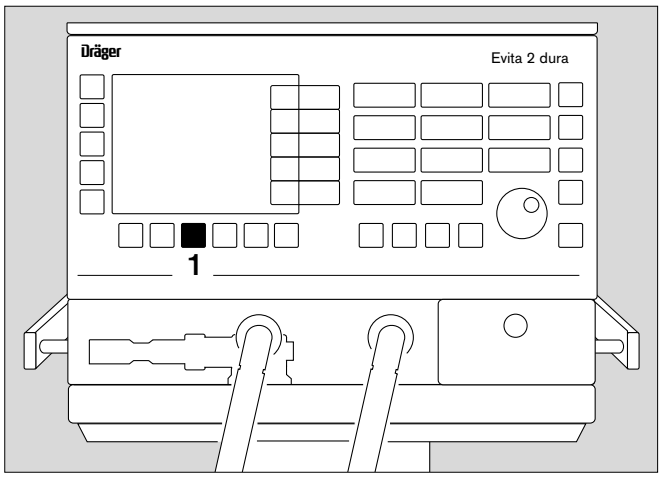
V_{TASB}	Inspiratory tidal volume during an ASB stroke
RSB	Rapid Shallow Breathing[1)]
NIF	Negative Inspiratory Force[2)]

1) For a detailed description of RSB, see page 121.
2) For a detailed description of NIF, see page 121.
Use of NIF, see "Manual expiration", page 43.

Curve freezing

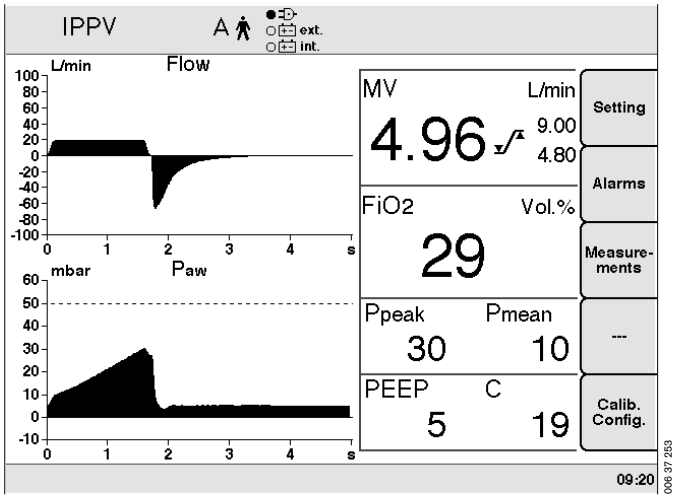
To study the curve(s) in detail:

1 Press the »**Freeze** « key.



To return to displaying new curve(s):

1 Press the »**Freeze** « key again.



Special Functions

Manual inspiration

This function may be used in all modes except CPAP spontaneous breathing without ASB pressure support. An automatic ventilation stroke can be triggered independently of the starting time and extended up to a maximum of 15 seconds.
Or:
Between two automatic ventilation strokes, a ventilation stroke can be manually started and held for a maximum 15 seconds.

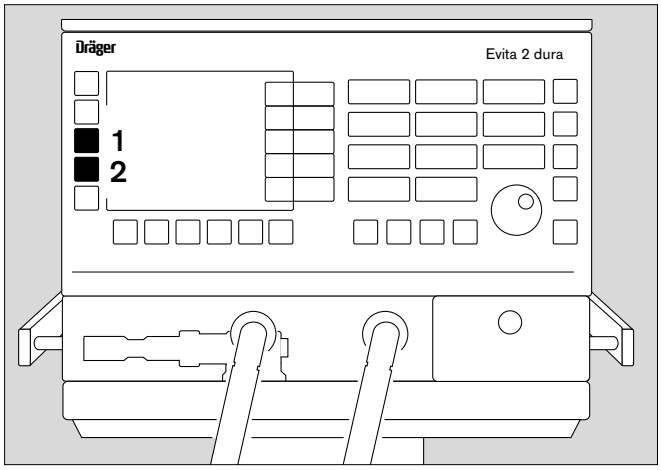
The pattern of the manually started ventilation stroke depends on the ventilation mode used.

For IPPV, SIMV and MMV:
volume-controlled ventilation stroke, defined by the V_T and T_{insp} settings.

For BIPAP:
pressure-controlled ventilation stroke, defined by the P_{insp} and T_{insp} settings.

For CPAP/ASB:
pressure-controlled ventilation stroke, defined by the P_{ASB} setting.

1 Press and hold down the »**Insp. hold**« key for as long as inspiration is required.



Either an automatic ventilation stroke that has just begun will be prolonged for as long as the key is held down, or a new ventilation stroke will be started and prolonged for as long as the key is held down – in each case for a maximum of 15 seconds.

Manual expiration hold

Active in all ventilation modes.

For determining the weaning value NIF[1)]

2 Hold down the »**Exp. hold**« key.

The expiration phase remains effective and Evita 2 dura determines the measured NIF value as long as the key is pressed.
After 15 seconds, the system automatically interrupts the expiration phase.

1) For a detailed description of NIF, see page 121.

Medicament nebulisation

During adult ventilation

Applicable in every ventilation mode.
Evita 2 dura applies the medicament aerosol in synchronisation with the inspiratory flow phase and maintains the minute volume constant.

Depending on the set O_2 concentration, the ventilator supplies the medicament nebuliser with medical air, pure oxygen or a mixture of medical air and oxygen. Deviations in O_2 concentration are therefore kept to a minimum.

In extreme cases (with a minimum inspiration flow of 15 L/min), the deviations can be up to ±4 % by volume*. To avoid greater deviations, medicament nebulisation is automatically switched off with inspiration flows of less than 15 L/min.

During paediatric ventilation

Medicament nebulisation is possible in the pressure-controlled paediatric ventilation modes.

In volume-controlled ventilation modes, medicament nebulisation is only possible with AutoFlow® (optional extra).

Unlike in adult ventilation, the medicament nebuliser nebulises continuously in paediatric ventilation, but the aerosol generated during expiration does not reach the lungs.

Depending on the set O_2 concentration, the medicament nebuliser is supplied by the ventilator with medical air, oxygen or a mixture of medical air and oxygen. Deviations in O_2 concentration are therefore kept to a minimum.

We recommend that you do not use the medicament nebuliser at breathing rates of less than 12 bpm.

For breathing rates above 12 bpm, please refer to the graph on page 122 of these Instructions for Use.

The maximum possible deviations in O_2 concentration are ±4 % by volume.

For breathing rates of less than 12 bpm, the deviations in O_2 concentration may be much greater.

These deviations cannot be detected by the device's internal O_2 concentration monitor.

---

* For a detailed description of the inspiratory O_2 concentration during medicament nebulisation, please refer to the Appendix, page 122.

The medicament nebuliser is automatically switched off after 30 minutes.
After administration of the aerosol, the flow sensor is automatically cleaned and calibrated in order to prevent malfunctions in flow measurement.

Use only medicament nebuliser 84 12 935 (white middle section).
Prepare the medicament nebuliser as specified in the specific Instructions for Use.

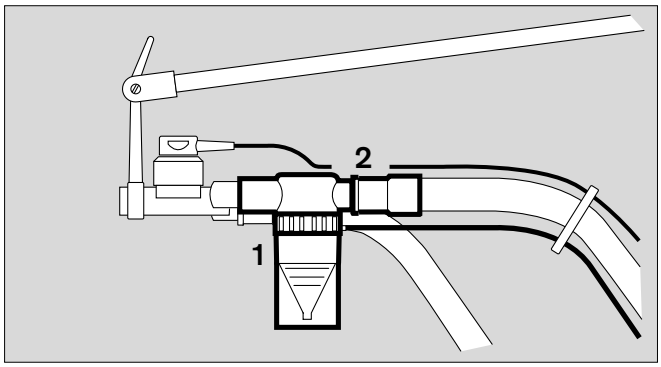
If other pneumatic medicament nebulisers are used, major deviations in tidal volume and inspiratory O_2 concentration may be caused.

For use during adult ventilation

1 Connect the nebuliser to the inspiratory side (temperature sensor side) of the Y-piece.

2 Connect the inspiration hose to the medicament nebuliser.

- Place the medicament nebuliser in the vertical position.
- Using hose clips, route the nebuliser hose back to the ventilator along the expiratory hose.

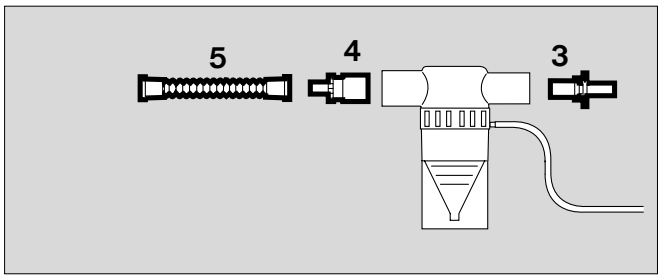


For use during paediatric ventilation

3 Insert the catheter connector (ISO cone Ø 15 / Ø 11) into the inlet of the medicament nebuliser.

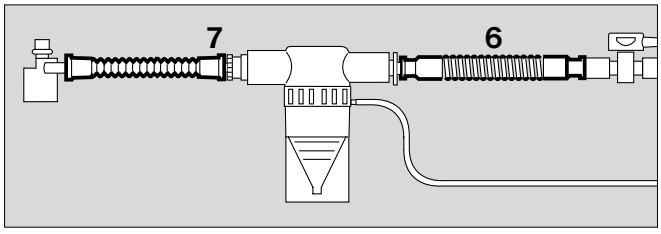
4 Insert the adapter (ISO cone Ø 22 / Ø 11) into the outlet.

5 Fit the corrugated hose (0.13 m long) on to the outlet adapter.



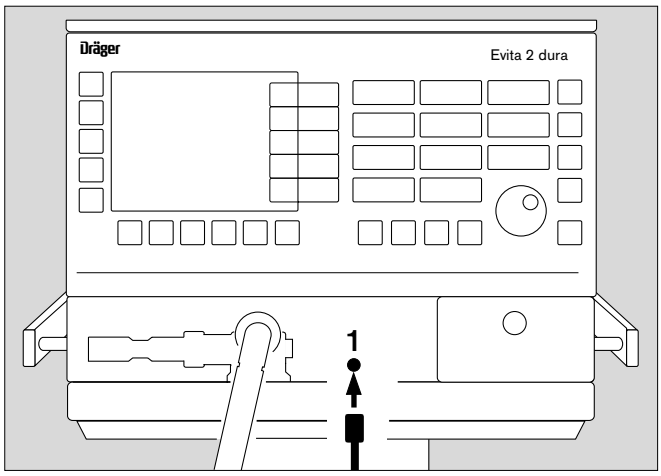
6 Remove the corrugated hose of the hose set from the inspiratory adapter of the Y-piece and connect it to the inlet adapter of the medicament nebuliser.

7 Connect the free end of the corrugated hose on the nebuliser outlet to the inspiratory adapter of the Y-piece.



1 Connect the nebuliser hose to the port on the front panel of the Evita 2 dura.

- Fill the medicament nebuliser in accordance with its specific Instructions for Use.



Warning: the effect of aerosols on sensors, filters and heat and moisture exchangers (HME) must be taken into account.
The measuring function of the flow sensor may be impaired.
The flow resistance of filters is liable to increase and may impair ventilation.

Do not place a microbial filter on the nebuliser outlet during nebulisation!

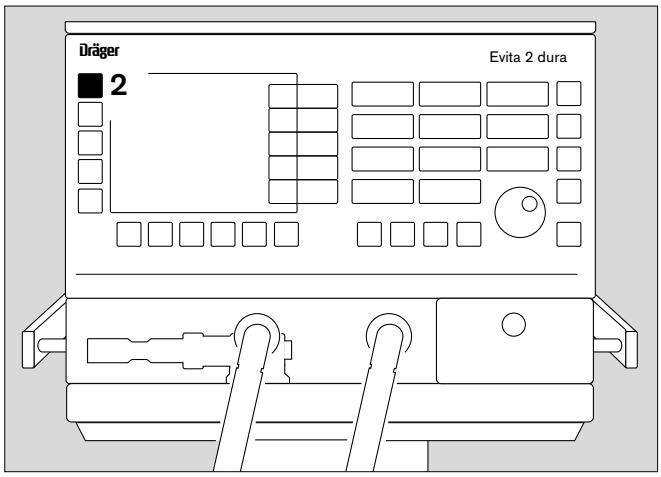
During medicament nebulisation, do not use a heat and moisture exchanger (HME) at the Y-piece. Risk of increased breathing resistance!

2 Hold down key »☞« until the yellow LED lights up.

- Advisory message on the screen:

  Nebuliser on!

  The nebuliser remains in operation for 30 minutes.



If you wish to interrupt medicament nebulisation before it is complete:

2 Press »☞« again. The yellow LED goes out, the nebuliser will be switched off.

The flow sensor is then automatically cleaned and calibrated.

- Remove residual medicament. Strictly follow the Instructions for Use of the medicament nebuliser.

Oxygen enrichment for bronchial suction

To avoid any risk of hypoxia during bronchial suction, Evita 2 dura offers a programme for oxygen enrichment during the removal of secretions.

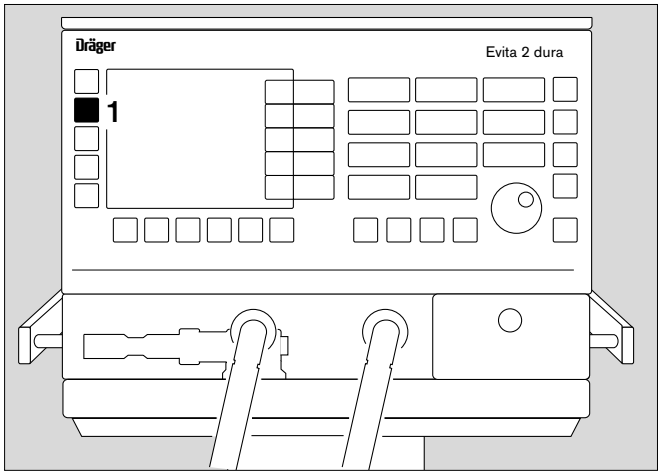
After the programme is started, Evita 2 dura ventilates the patient in the selected ventilation mode for an initial oxygen enrichment phase of 180 seconds. In adult mode, the ventilator supplies 100 % oxygen by volume, and in paediatric mode it delivers the set O_2 concentration* plus 25 %
(for example: setting = 60 % by vol.;
administered = 75 % by vol.)

When the ventilator is disconnected for suction, Evita 2 dura interrupts the ventilation. During the suction time, the audible alarms are suppressed, so that the suction routine is not disturbed.

After suction and automatically recognised reconnection, Evita 2 dura delivers an increased O_2 concentration for the final oxygen enrichment phase of 120 seconds. In adult mode, the O_2 concentration is 100 % by volume. In paediatric mode, the enriched concentration is 25 % higher than the set concentration.
During suction and for 2 minutes afterwards, the lower alarm limit for the minute volume is switched off.

Before suction

1 Hold down the »**O_2 ↑ Suction**« key until the yellow LED comes on.
Evita 2 dura ventilates the patient in the set ventilation mode with increased O_2 concentration: 100 % O_2 by volume in adult mode, and a 25 % higher O_2 concentration than the set value in paediatric mode.
If no PEEP greater than 4 mbar is set, a PEEP of 4 mbar will be automatically activated. This PEEP enables the Evita 2 dura to detect subsequent disconnection.
The other ventilation parameters remain unchanged.



- Display in the help line at the bottom edge of the screen:

  O_2 enrichment 180 s

The remaining time is counted down continuously. This initial oxygen enrichment lasts for a maximum of 180 seconds. During this time, Evita 2 dura waits for a disconnection for suction.
If there is no disconnection after expiry of the 180 seconds, the oxygen enrichment programme is automatically terminated.

* For a detailed description of the inspiratory O_2 concentration during medicament nebulisation, please refer to the Appendix, page 122.

After disconnection for suction

Evita 2 dura delivers a minimal flow for the duration of disconnection in order to detect the end of the disconnection phase automatically. In the help line at the bottom of the screen, the amount of time available for suction is continuously counted down (example):

Execute suction and reconnect 120 s

If suction is ended and ventilation reconnected within the displayed time, Evita 2 dura starts the final O_2 enrichment phase.

Automatic interruption of oxygen enrichment

If there is still no reconnection after 120 seconds, the oxygen enrichment programme is reeminated. All alarms are immediately reactivated. Evita 2 dura immediately continues ventilating in the set ventilation mode.

After reconnection

Evita 2 dura continues ventilating in the set ventilation mode, except that for final oxygen enrichment the increased oxygen concentration of 100 % by volume for adults and 25 % above the set concentration for paediatric ventilation will continue to be delivered for 120 seconds.

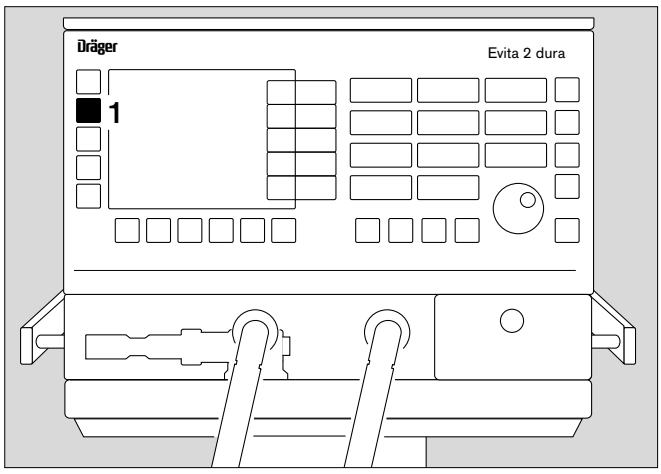
- Message in the help line at the bottom of the screen:

  Final O_2 enrichment 120 s

The time remaining is counted down continuously.

To interrupt oxygen enrichment

1 Press the »**O_2 ↑ Suction**« key again.



Selecting Standby Mode

No ventilation takes place in standby mode!

– to select the patient mode

– to perform the device check

– to maintain Evita 2 dura ready for operation

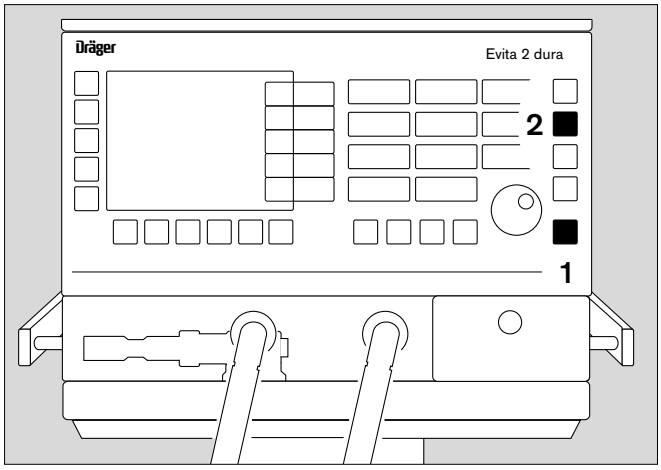
– to preset ventilation parameters and alarm limits.

Switching to Standby

1 Hold down the » ⏻ « key for about 3 seconds.
The Standby alarm tone is sounded.

2 The »**Alarm Reset**« key can be used to switch off the Standby alarm tone.

The standby alarm tone can no longer be muted with the » 🔕 « key.



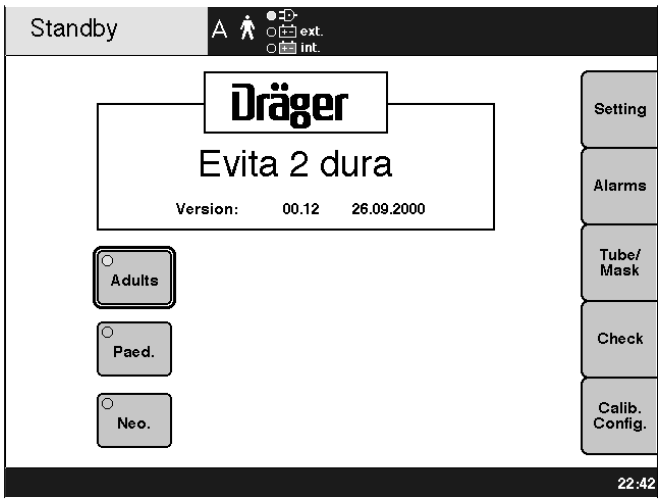
Terminating standby mode

– to continue ventilation.

1 Press » ⏻ « key.
The LED goes out, and ventilation commences.

If the patient mode is changed while on standby, Evita 2 dura will determine new starting values for ventilation, see page 64.

Display (example):



Calibrating

The saved calibration / zeroing values remain stored even when the machine is switched off.

The pressure sensors for measuring the airway pressure are calibrated automatically.

The O_2 sensor and flow sensor are calibrated automatically every day.

The flow sensor and O_2 sensor can be calibrated manually at any time, even during ventilation.

Calibrating the O_2 sensor manually

– Before operation, during the device check

– After replacing the O_2 sensor
(wait for the 15-minute warm-up time of the O_2 sensor).

– If the measured value and set value deviate from each other by more than 2 Vol.%.

The O_2 sensor can be calibrated at any time, even during ventilation. The applied O_2 concentration is not affected by the calibration process.

Make sure that the O_2 supply of the device is on.

Start calibration:

- Press the »**Calib./Config.**« menu key.
- Select the »**O_2**« menu key = turn the rotary knob.
- Start »**O_2**« calibration = press the rotary knob.

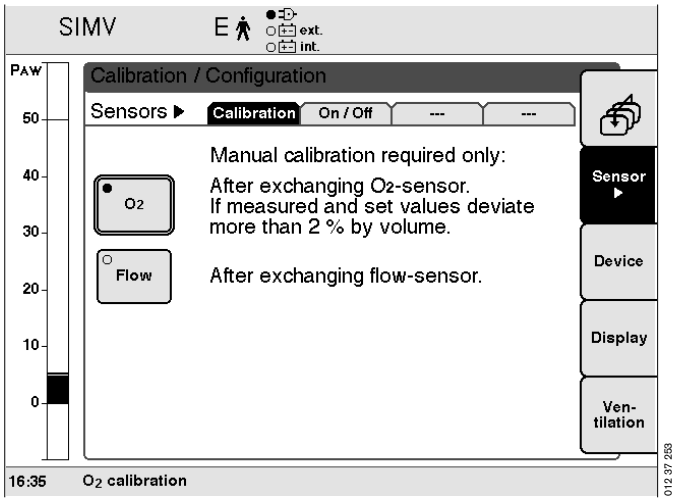
Display (example):

Message in the help line at the bottom of the screen:

O_2 calibration

After calibration is complete, the following message appears in the help line:

Calibration ok



Calibrating the flow sensor manually

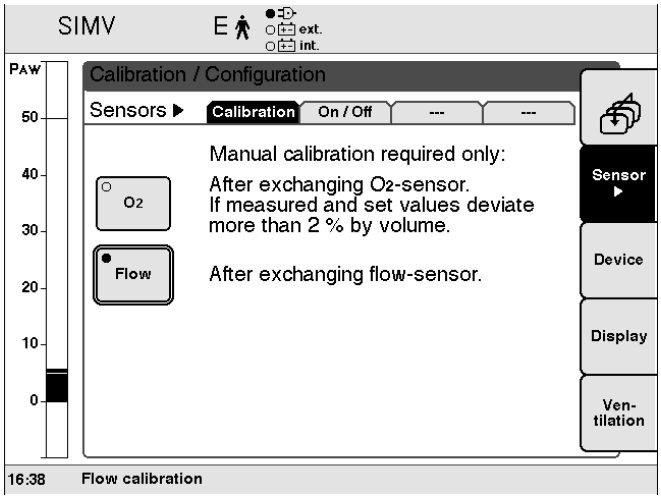
– Before operation, during the device check.
– After replacing the flow sensor.

The flow sensor is cleaned and calibrated automatically after every use of the medicament nebuliser.

To start calibration:

- **Avoid flammable gases (e.g. alcohol vapours after disinfection).**
- Press the »**Calib./Config.**« key.
- Select the »**Flow**« screen key = turn the rotary knob.
- Start calibration = press the rotary knob.

Display (example):



Evita 2 dura uses the next inspiration phase for the calibration. Short inspiration times are prolonged to about 1 second.

Message in the help line at the bottom of the screen:

Flow calibration

After calibration is complete, the following message appears in the help line:

Calibration ok

External flow source

When a constant external flow of up to 12 L/min is applied (e.g. during medicament nebulisation with separate gas supply and not from Evita 2 dura or during separate tracheal gas insufflation), this flow can be determined by Evita 2 dura and the tolerance for the flow sensor monitoring parameters increased in order to prevent generation of the alarms "Flow measurement fault" and "Neo. flow measurement fault" (NeoFlow option) during these applications.
The original measurement of the expiratory volume is continued:
During an expiratory flow, Evita 2 dura measures a correspondingly higher value for V_{Te} and MV.

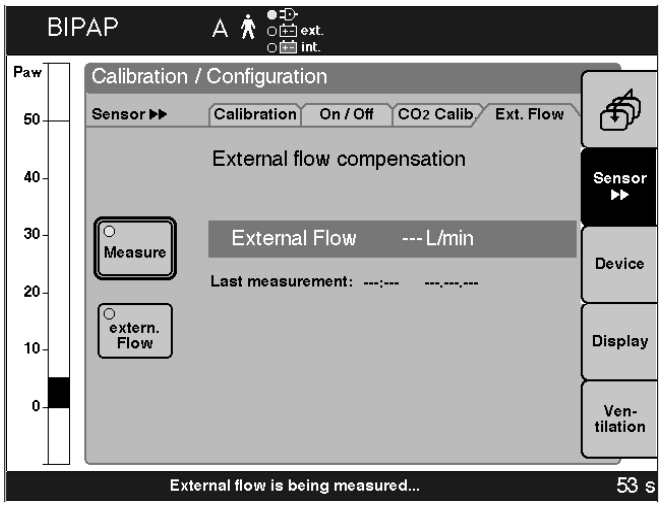
To avoid alarms:

- Adjust the upper alarm limit for MV.

To determine the external flow:

- Press menu button **»Calib./Config.«**.
- Select the menu »**Ext. Flow**« via the menu button »**Sensor ▶▶**«.
- Select screen key **»Measure«** = turn rotary knob, confirm = press rotary knob.
- Yellow LED lights up in the »**Measure**« key.

The external flow is calculated by Evita 2 dura.
Display during calculation:



Determining external flow

Once the external flow has been determined, it is displayed by Evita 2 dura together with the time and date. The following message is simultaneously displayed by Evita 2 dura:

Confirm value via ⊙

- Confirm = press rotary knob.

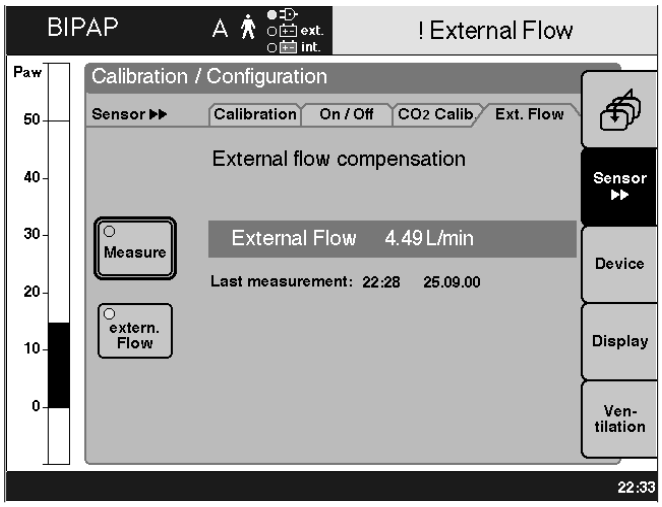
Determination of the external flow is aborted by Evita 2 dura if it exceeds 12 L/min or if flow measurement by Evita 2 dura is faulty.

When the external flow has been determined successfully, it is taken into account in the monitoring of the flow sensor:
the yellow LED in the key »**Extern. flow**« lights up.

The advisory message

External flow !

is displayed as long as the external flow is taken into account by Evita 2 dura.



When an external flow is not applied:

- Switch off: select key »**Extern. flow**« =
  turn rotary knob,
  confirm = press rotary knob.

Once the external flow has been measured by Evita 2 dura, its inclusion can be reactivated at any time:

- Select screen key »**Extern. flow**« =
  turn rotary knob,
  confirm = press rotary knob.

If the external flow changes:

- Press key **»Measure«** so that the external flow can be redetermined by Evita 2 dura.

Switching off the monitor functions

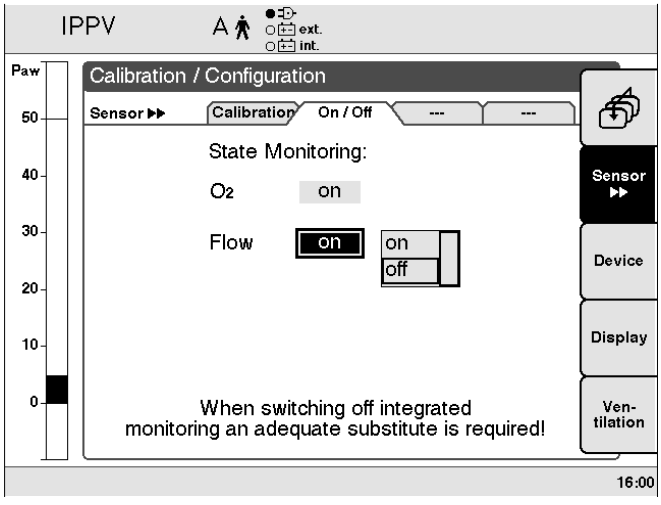
E.g. if a spent sensor cannot be immediately replaced.

- **An adequate external monitoring function must immediately be ensured!**

Example: Switching off Flow Monitoring.

- Press the »**Calib./Config.**« menu key.
- Select »**Sensor on/off**« with the »**Sensor ▶▶**« menu key.

Example display:



- Select the »**Flow on**« screen line =
  turn the rotary knob.
  Confirm = press the rotary knob.
- In the selection menu, select »**off**« =
  turn the rotary knob.
  Confirm = press the rotary knob.

  The corresponding measured values disappear.
  The alarm function is deactivated.

To switch the monitor function back on after replacing the sensor:

- Select »**Flow off**« screen line =
  turn the rotary knob.
  Confirm = press the rotary knob.
- In the selection menu, select »**on**« =
  turn the rotary knob.
  Confirm = press the rotary knob.

Configuration

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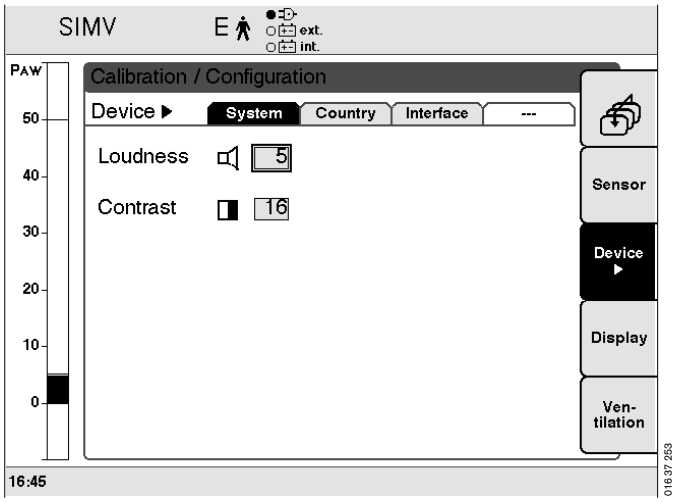
System Settings

Adjusting the volume of the audible alarm

- Press the »**Calib./Config.**« menu key.
- Press the »**Device ▶**« menu key.
  The »**System**« menu appears.

Display (example):



- Select the »**Loudness**« screen field = turn the rotary knob.
  Activate = press the rotary knob.
- Set the desired volume = turn the rotary knob.
  Confirm = press the rotary knob.

  After the setting has been confirmed, the alarm tone is sounded once to enable you to judge the volume.

Setting the contrast

Not possible with all types of monitor

- Press the »**Calib./Config.**« menu key.
- Press the »**Device ▶**« menu key.
  The »**System**« menu is displayed.
- Select the »**Contrast**« field on the screen = turn the rotary knob.
  Activate = press the rotary knob.
- Setting the contrast = turn the rotary knob,
  confirm = press the rotary knob.

  The set contrast will now be activated.

Country-specific settings

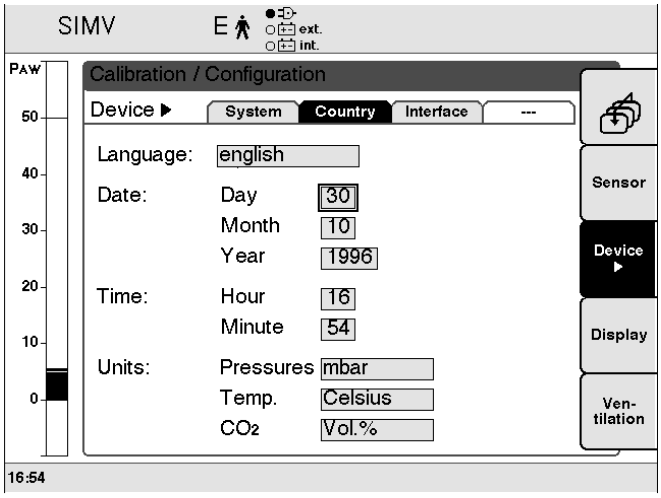
Selecting the language

Evita 2 dura is supplied in the language of the customer's country.
The following languages can be selected:

- **English**
- **French**
- **Italian**
- **Spanish**
- **Dutch**
- **Swedish**
- **American English**
- **Japanese**
- **Greek**
- **Russian**
- **Portuguese**
- **Arabic**
- **Chinese**
- **Turkish**

- Press the »**Calib./Config.**« menu key.
- Press the »**Device ▶**« menu key.
- With the »**Device ▶**« menu key, select the «**Country**« menu.

Display (example):



- Select the »**Language**« screen field = turn the rotary knob.
  Confirm = press the rotary knob.
- Select language = turn the rotary knob.
  Confirm = press the rotary knob.

Setting the date and time

- Press the »**Calib./Config.**« menu key.
- Press the »**Device ▶**« menu key.
- With the »**Device ▶**« menu key, select the »**Country**« menu.
- Select the »**Day**« screen field = turn the rotary knob.
  Confirm = press the rotary knob.
- Set the date = turn the rotary knob.
  Confirm = press the rotary knob.
- Set the month, year, hour and minute in the same way.

Selecting measuring units

- Press the »**Calib./Config.**« menu key.
- Press the »**Device ▶**« menu key.
- With the »**Device ▶**« menu key, select the »**Country**« menu.

Under units:

- Select the »**Pressures**« screen field = turn the rotary knob.
  Confirm = press the rotary knob.
- Set »**Temp.**« and »**CO_2**« (option) in the same way.

Interface

Selecting the interface

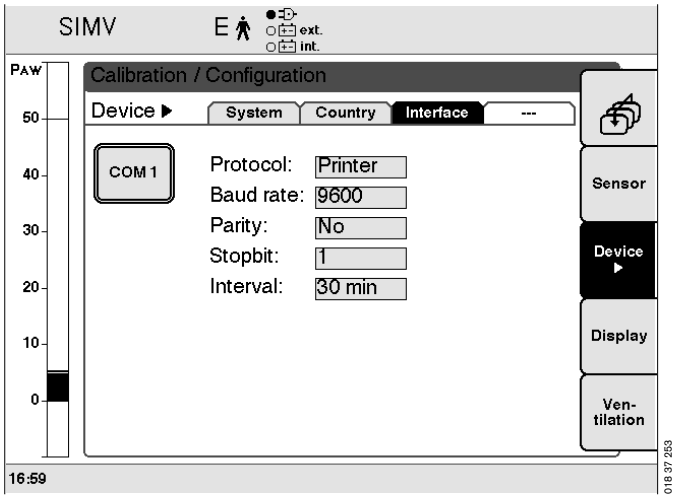
Evita 2 dura offers the following interface protocols:

– Printer (HP Deskjet 500 Series 500 and compatible printers with serial interface)

– MEDIBUS (Dräger communications protocol for medical appliances)

– LUST (List-controlled universal interface driver program, compatible with the Evita RS 232 interface as from software version 7.n)

- Press the »**Calib./Config.**« menu key.
- Press the »**Device ▶**« menu key.
- With the »**Device ▶**« menu key, select the »**Interface**« menu.
- Select the screen key corresponding to the required interface, »**COM1**«, »**COM2**«, »**COM3**« and »**Analog**« = turn the rotary knob.
  Confirm = press the rotary knob.
  (COM2, COM3 and Analog are optional).
- Select the desired interface protocol in the "Protocol" screen field = turn the rotary knob.
  Confirm = press the rotary knob.



- Select the screen field corresponding to the desired interface parameter = turn the rotary knob.
  Confirm = press the rotary knob.
- Set the desired value = turn the rotary knob.
  Confirm = press the rotary knob.

Adapting the interface protocols:

- See the Instructions for Use of the device you want to connect.

  For the printer protocol:
  Baud rate
  Set printer interval as required

  For the MEDIBUS protocol:
  Baud rate
  Parity check bits
  Number of stop bits

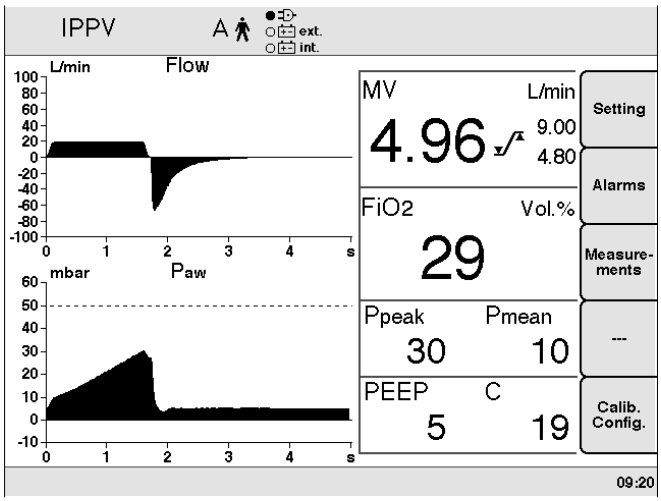
  For the LUST protocol:
  Baud rate

Screen

Selecting the displayed combination of measured values

Evita 2 dura displays a group of 6 selectable measured values in the right-hand field of the main page.

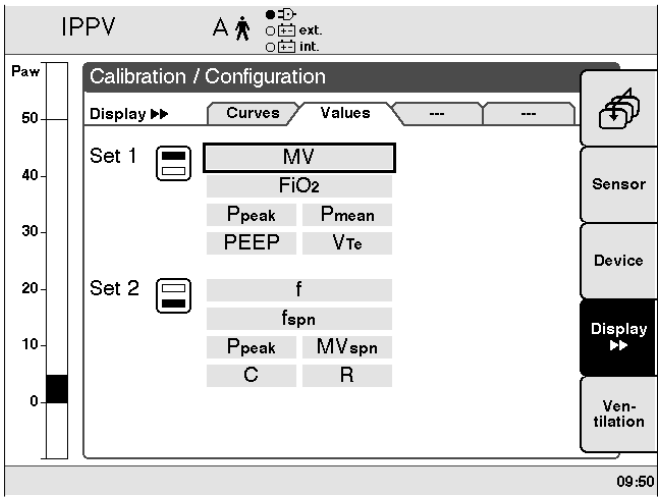
An alternative second group can be displayed by pressing the **»Values 1▭ 2▭ «** key.



These two groups can be composed in the configuration page:

- Press the »**Calib./Config.**« menu key.
- Press the »**Display ▶▶**« menu key.
- With the »**Display ▶▶**« menu key, select the »**Values**« menu.

Display (example):



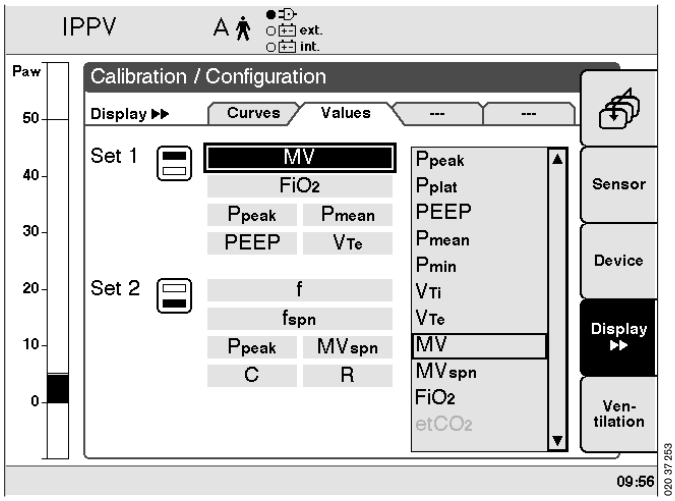
To replace one displayed measured value by another:

- Select the relevant screen field = turn the rotary knob. Activate = press the rotary knob.

The selection list with all available measured values is then displayed on the right of the screen.

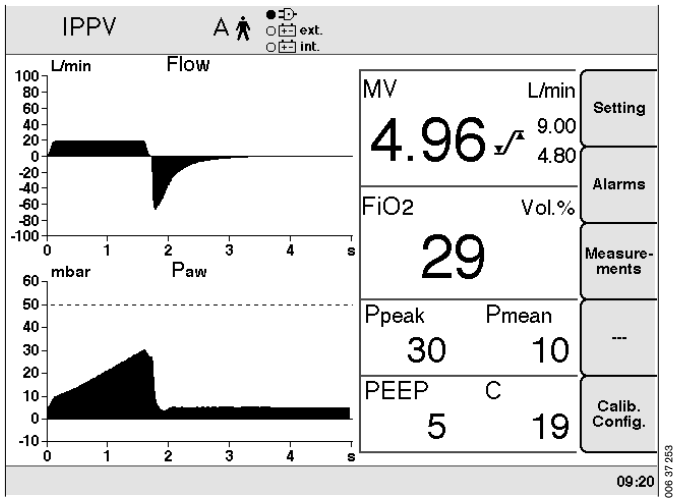
Display (example): Replacing MV

- Select the other measured value, e.g. »**MV**«
  = turn the rotary knob.
  Confirm = press the rotary knob.



Selecting the displayed curves

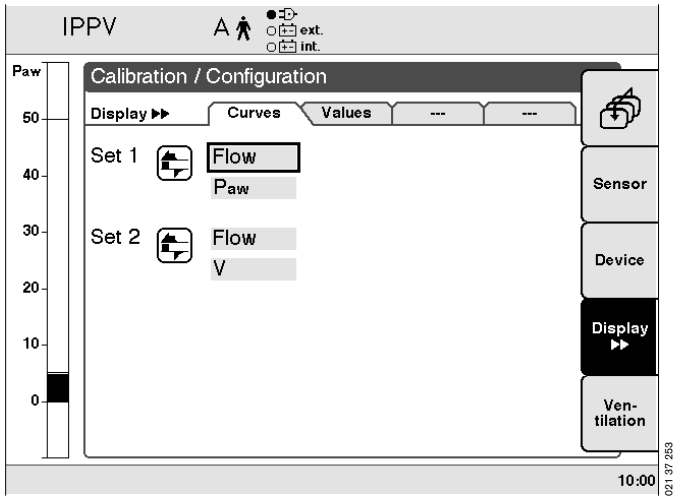
Evita 2 dura shows two curves in the left-hand field of the main page.
A different pair of curves can be selected by pressing the »**Curves** « key.



The curve pairs can be combined as required.

- Press the »**Calib./Config.**« menu key.
- Press the »**Display ▶▶**« menu key.
  The »**Curves**« menu appears.

Display (example):

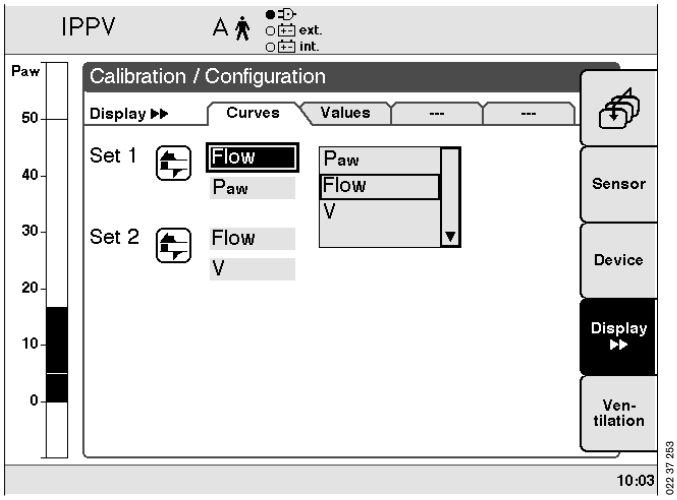


One displayed curve can be replaced by another:

- Select the relevant field = turn the rotary knob.
  Activate = press the rotary knob.

The list of all available curves to choose from is displayed on the right-hand side of the screen.

Display example: Replacing Paw



- Select the other curve (»**Flow**«) = turn the rotary knob.
  Confirm = press the rotary knob.

Ventilation Defaults

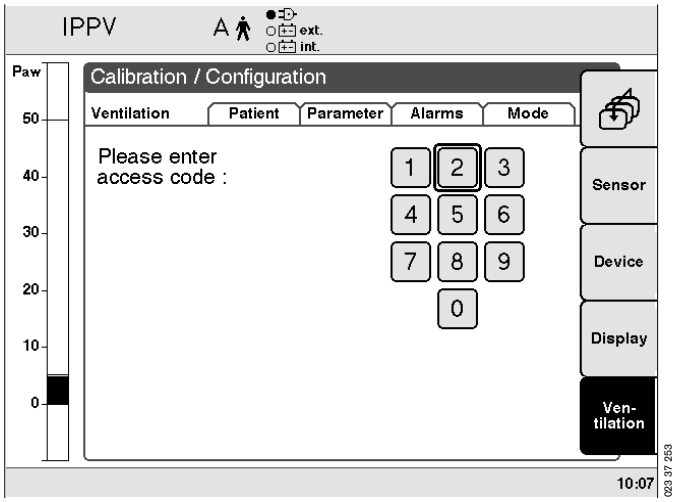
– For defining the patient-specific start-up parameters »**f**« and »**VT**«.

– Ventilation parameters active on starting up the device.

– Alarm limits active on starting up the device.

– Ventilation mode.

The »**Ventilation**« menu for the default settings active on starting ventilation can only be accessed after entering the code number 3032.
This code-protection is designed to prevent accidental changes to the configuration.



Patient-specific defaults

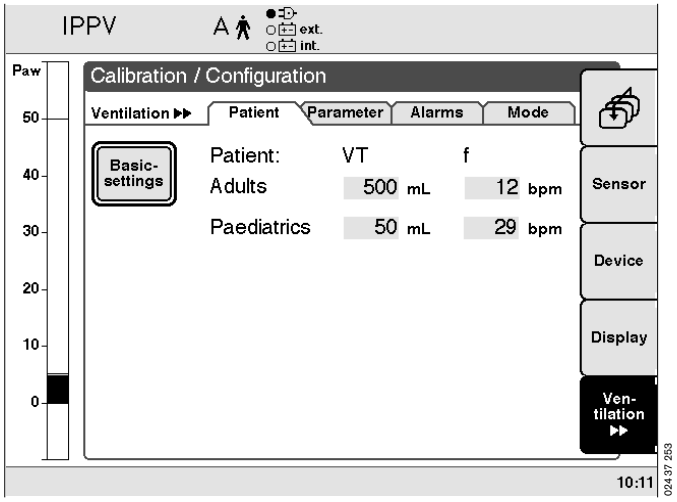
for Adult or Paediatric mode.

– To set the values of the »**VT**« and »**f**« parameters active on starting up the device.

- Press the »**Calib./Config.**« menu key.
- Press the »**Ventilation ▶▶**« menu key.
- Enter code number »**3032**«.
- The »**Patient**« menu is displayed.

Display (example):

- Select the »**VT**« screen field = turn the rotary knob. Confirm = press the rotary knob.
- Set the desired value = turn the rotary knob. Confirm = press the rotary knob.



Patient-specific defaults VT, f:

Patient mode	Factory-set		Hospital-specific settings*	
	Tidal volume VT mL	Ventilation frequency f 1/min	Tidal volume VT mL	Ventilation frequency f 1/min
Paediatric	50	29	.....	.....
Adult	500	12	.....	.....

* The hospital-specific defaults for your hospital can be entered in the table.

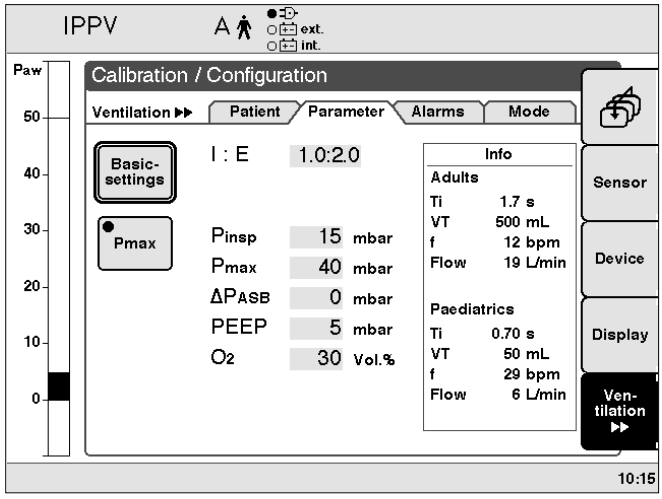
Default ventilation parameter values

– These defaults specify the ventilation parameters and alarm limits that are not patient-specific and are activated on starting up the device.

- Press the »**Calib./Config.**« menu key.
- Press the »**Ventilation ▶▶**« menu key.
- Enter code number »**3032**«.
- Select the »**Parameter**« menu with the »**Ventilation ▶▶**« menu key.

Display (example):

- Select the Pmax desired screen field = turn the rotary knob.
  Confirm = press the rotary knob.
- Set value = turn the rotary knob.
  Confirm = press the rotary knob.



Default ventilation parameters

The hospital-specific defaults can be entered in the table below.

	I:E	P_{insp} mbar	P_{ASB} mbar	PEEP mbar	Ramp s	Trigger L/min	O_2 Vol.%
Factory setting	1:2	15	0	5	0.2	5	30
Hospital-specific setting*	.....	.....	.....	.....	.....	.....	.....

* The hospital-specific defaults for your hospital can be entered in the table.

To restore the factory-set defaults:

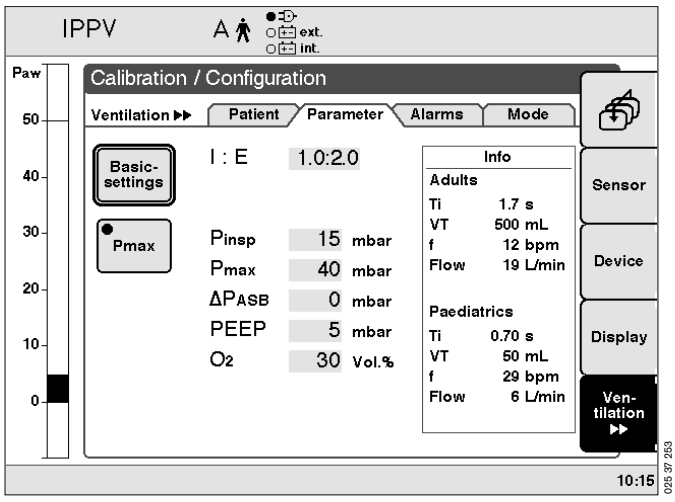
- Select the »**Basic settings**« screen field = turn the rotary knob.
  Confirm = press the rotary knob.

Activating / deactivating pressure limit Pmax

– This parameter defines the pressure limit for pressure-limited ventilation in the IPPV, SIMV and MMV ventilation modes.

- Press the »**Calib./Config.**« menu key.
- Press the »**Ventilation ▶▶**« menu key.
- Enter code number »**3032**«.
- With the »**Ventilation ▶▶**« menu key, select the »**Parameter**« menu.

Display (example):

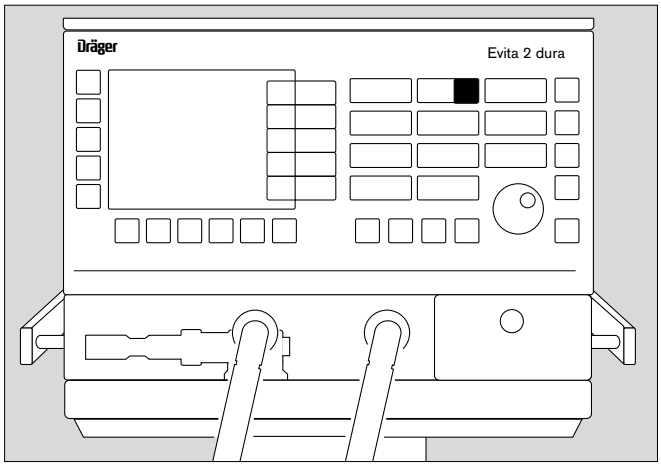


- Select the »**Pmax**« screen key = turn the rotary knob.

  The "LED" in the screen key »**Pmax**« lights up yellow. Pmax is activated.
- Deactivate Pmax = press rotary knob, the "LED" in the screen key »**Pmax**« lights up green.

Set the value for »Pmax«:

- Press the »**Pinsp**« parameter key.
- Set the desired value = turn the rotary knob. Confirm = press the rotary knob.



Apnoea ventilation on/off

To determine whether apnoea ventilation is automatically ready for use when starting.

- Press menu button **»Calib./Config.«**.
- Press menu button »**Ventilation ▶▶**«.
- Enter code number »**3032**«.
- Select the menu »**Mode**« via the menu button »**Ventilation ▶▶**«.
- Select screen key **»Apnoea vent.«** = turn rotary knob.
- Switch on apnoea ventilation = press rotary knob, the "LED" in the screen key **»Apnoea vent.«** lights up yellow.
- Switch off apnoea ventilation = press rotary knob, the "LED" in the screen key **»Apnoea vent.«** lights up green.

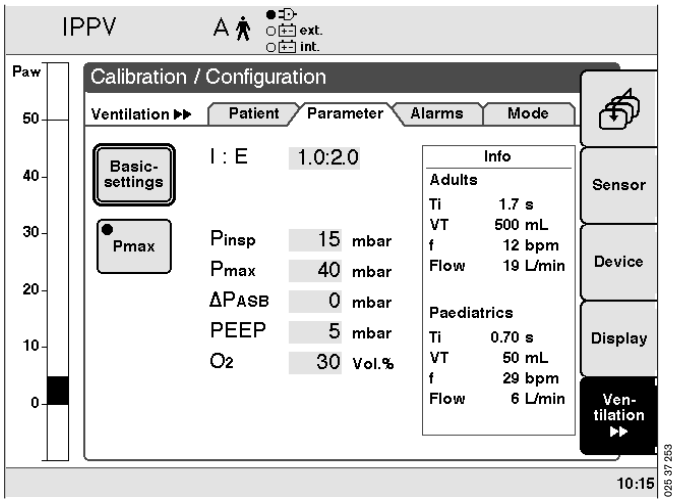
Leakage compensation* on/off

Automatic leakage compensation allows the unit to compensate leakages up to 100 % of the set tidal volume in all volume-controlled ventilation modes.

The setting for "Leakage compensation on/off" is saved and remains effective when the unit is restarted.

- Press menu button »**Calib./Config.**«,
- Press menu button »**Ventilation ▶▶**« and enter the numerical code **3032**.
- Select the menu »**Parameters**« via the menu button »**Ventilation ▶▶**«.

Display:



- Select screen key »**Leakage comp.**«,
- Switch on »**Leakage comp.**« = press rotary knob, the "LED" in the screen key »**Leakage comp.**« lights up yellow.

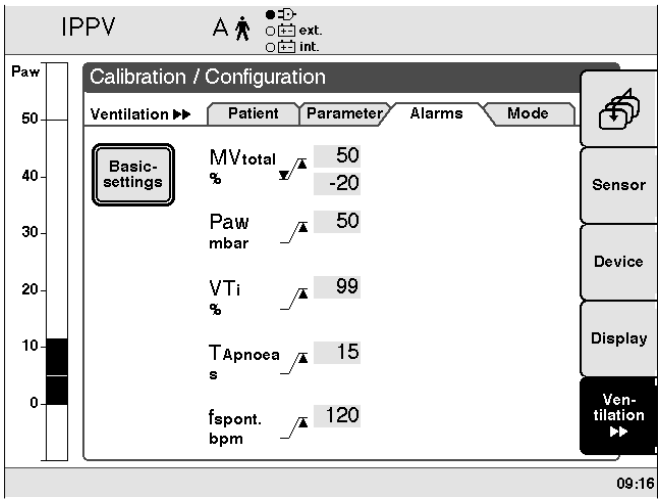
- Switch off »**Leakage comp.**« = press rotary knob, the "LED" in the screen key »**Leakage comp.**« lights up green.

*) For a detailed description of leakage compensation, refer to page 119 in the Annex.

Default alarm limits

- Press the »**Calib./Config.**« menu key.
- Press the »**Ventilation ▶▶**« menu key.
- Enter code number »**3032**«.
- With the »**Ventilation ▶▶**« menu key, select the »**Alarms**« menu.

Display (example):



- Select the screen field of the desired alarm limit = turn the rotary knob.
  Confirm = press the rotary knob.
- Change the value = turn the rotary knob.
  Confirm = press the rotary knob.

Default alarm limits

Ventilation parameters		Factory-set defaults	Hospital-set defaults*
MV_{total} ▼/▲	L/min	MV_{total} +50 % MV_{total} –20 %	....
Paw ▲	mbar	50	....
V_{Ti} ▲	L	V_{Ti} + 100 %	....
T_{Apnoea} ▲	s	15	....
f_{spont} ▲	1/min	50	....

* The selected hospital-specific defaults can be entered in the table.

The lower alarm limit does not have to be set for the airway pressure Paw, because it is automatically coupled with the PEEP setting.

The alarm limits do not have to be set for the O_2 concentration because they are automatically coupled with the O_2 concentration setting.

Lower alarm limits:
for settings up to 60 Vol.% O_2:
set value – 4 Vol.% O_2
for settings from 60 to 100 Vol.% O_2:
set value – 6 Vol.% O_2

Upper alarm limits:
for settings up to 60 Vol.% O_2:
set value +4 Vol.% O_2
for settings from 60 to 100 Vol.% O_2:
set value +6 Vol.% O_2

To restore the factory-set defaults:

- Select the »**Basic settings**« screen field = turn the rotary knob.
  Confirm = press the rotary knob.

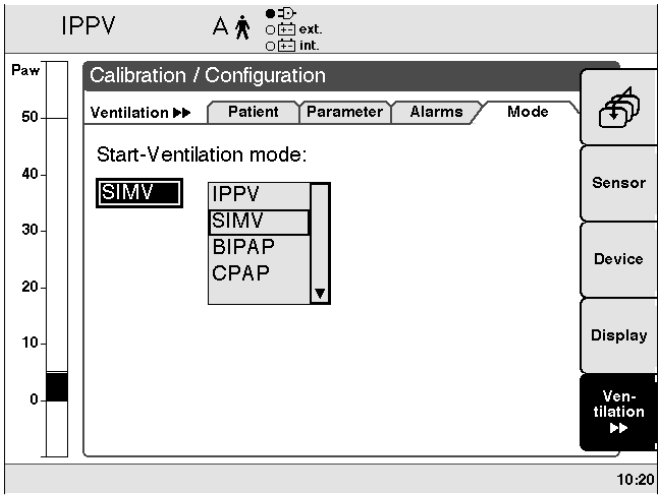
Default ventilation mode

After switching on, Evita 2 dura starts up in the ventilation mode displayed when this screen key is selected.

If you require a different start-up ventilation mode:

- Press the »**Calib./Config.**« menu key.
- Press the »**Ventilation ▶▶**« menu key.
- Enter code number »**3032**«.
- With the »**Ventilation ▶▶**« menu key, select the »**Mode**« menu.

Display example: SIMV



- Select the screen field for the ventilation mode = turn the rotary knob.
  Confirm = press the rotary knob.
  The list of all available ventilation modes to choose from is then displayed on the right hand side of the screen.
- Select the other ventilation mode = turn the rotary knob.
  Confirm = press the rotary knob.

Fault – Cause – Remedy

Contents

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Fault – Cause – Remedy

Alarm messages in the alarm display field are displayed in hierarchical order.
If, for example, two faults are detected at the same time, the more critical of the two is displayed.

The priority for alarm messages is marked by exclamation marks:
Warning = Message with top priority **!!!**
Caution = Message with medium priority **!!**
Advisory = Message with low priority **!**

In the table below, the messages are listed in alphabetical order.
The table should help you identify the cause of any alarm, and to ensure rapid remedy of the problem.

Message	Cause	Remedy
!!! Air supply down	Air supply pressure too low.	Make sure pressure is greater than 3 bar.
! Air supply down	Air supply pressure too low. Air supply pressure not required when FiO_2 = 100 Vol.%.	Make sure pressure is greater than 3 bar.
!! Air supply pressure high	Air supply pressure too high.	Ensure pressure is less than 6 bar.
! Air supply pressure high	Air supply pressure too high. Air supply is not needed for FiO_2 = 100 Vol.%.	Ensure pressure is less than 6 bar.
!!! Airway pressure high	The upper alarm limit for the airway pressure has been exceeded. The patient is "fighting" the ventilator, cough.	Check patient condition, Check ventilation pattern, Correct alarm limit if necessary.
	Ventilation hose buckled.	Check hose system and tube.
!!! Airway pressure low	Leaking cuff.	Inflate cuff and perform leak test.
	Leak or disconnection.	Check hose system for tight connections. Check that the expiration valve is properly engaged.
!!! Apnoea	Patient's spontaneous breathing has stopped.	Apply controlled ventilation.
	Stenosis	Check condition of patient. Check tube.
	Flow sensor not calibrated or faulty.	Calibrate flow sensor. Replace if necessary.
!! Apnoea ventilation	Due to detected apnoea, the system has switched over automatically to mandatory ventilation.	Check ventilation procedure. Return to the original ventilation procedure with »**Alarm Reset**«. Check condition of patient. Check tube.
! ASB > 1.5 s	Only appears in paediatric mode. The ASB cycle has been switched off 3 times due to time limitation.	Test ventilation system for leaks.
!!! ASB > 4 s	Only appears in adult mode. The ASB cycle has been switched off 3 times due to time limitation.	Test ventilation system for leaks.

Message	Cause	Remedy
!! **Check settings**	Power interruption while setting a ventilation pattern or the alarm limits.	Check pattern of ventilation and alarm limits. Confirm message with key »**Alarm Reset**«.
!!! **Device failure**	Device faulty.	Call DrägerService.
! **Evita Remote ?**	The Remote Pad has not been identified correctly.	Remove Remote Pad. Confirm message with key »**Alarm Reset**«. Call DrägerService at the next opportunity.
! **Evita Remote inop.**	Key pressed on Remote Pad during self-test.	Confirm message with key »**Alarm Reset**«. Remove Remote Pad and reconnect. Ensure that no key is pressed on the Remote Pad.
	Remote Pad faulty.	Confirm message with key »**Alarm Reset**«. Remove Remote Pad. Call DrägerService at the next opportunity.
!! **Execute device check**	Device check not performed.	Perform device check, page 97. Confirm message with »**Alarm Reset**« key.
! **Exp. hold interrupted**	The »**Exp. hold**« key has been pressed for more than 15 seconds.	Release the »**Exp. hold**« key.
!!! **Exp. valve inop.**	Expiration valve not properly connected to socket.	Push expiration valve firmly into socket until it clicks into place.
	Flow sensor not calibrated or defective.	Calibrate flow sensor, page 51, replace if necessary.
	Expiration valve faulty.	Replace expiration valve.
! **External Flow**	Evita 2 dura calculates the externally supplied flow when monitoring correct functioning of the flow measurement.	Deactivate calculation of the external flow, see page 53.
!!! **Fan failure**	Fan failure.	Call DrägerService.
!!! **FiO_2 high**	O_2 sensor not calibrated.	Calibrate O_2 sensor, page 50.
	Faulty mixer function.	Call DrägerService.
!!! **FiO_2 low**	O_2 sensor not calibrated.	Calibrate O_2 sensor, page 50.
	Faulty mixer function.	Call DrägerService.
!!! **Flow measurement inop.**	Water in flow sensor.	Dry flow sensor.
	Flow sensor faulty.	Calibrate flow sensor, page 51, replace if necessary.
	Flow measurement malfunction.	Call DrägerService.
! **Flow monitoring off**	Flow monitoring is switched off.	Switch on flow monitoring again, as described on page 95, or immediately ensure an adequate external monitor function.

Message	Cause	Remedy
!!! **Flow sensor ?**	Flow sensor not fully inserted in rubber lip of expiration valve.	Insert flow sensor correctly.
!! **Hard key xx failed**	Key xx (e.g. »🔔 «) can no longer be pressed.	Call DrägerService.
!!! **High frequency**	Patient is breathing at a high spontaneous frequency	Check condition of patient, Check pattern of ventilation, Correct alarm limit if necessary.
! **Insp. hold interrupted**	The »**Insp. hold**« key was held down longer than 15 seconds.	Release »**Insp. hold**« key.
!!! **Insp / Exp cycle failure**	The device does not deliver any gas.	Check the Pmax/PEEP setting. Set an IPPV frequency of at least 4/min. Increase T_{Apnoea} 🔔 alarm time.
	Device faulty.	Call DrägerService.
!! **Key xx overused ?**	Key has been pressed several times in a short period (e.g. »🔔 «).	Confirm message with key »**Alarm Reset**« If this message occurs repeatedly, call DrägerService.
!! **Key overused ?**	Due to very frequent key use, the screen contents of the display are repeatedly redrawn.	Confirm message with key »**Alarm Reset**«.
	Brief communication failure between the display processor and main processor.	Confirm message with key »**Alarm Reset**«. If this message occurs again, call DrägerService.
! **Leakage**	The measured leakage minute volume MV_{leak} is 20% higher than the minute volume measured on the expiration side.	Check that the hose connection is leakproof. Check that the tube is correctly fitted.
!!! **Loss of data**	Lithium battery discharged.	Call DrägerService.
! **Malfunction fan**	Temperature in machine too high.	Check fan function, clean cooling-air filter or call DrägerService.
! **MEDIBUS COM. inop.**	The connector of the MEDIBUS cable was unplugged during operation.	Plug the connector in again and secure it against disconnection with the two screws.
	MEDIBUS cable defective.	Use a new MEDIBUS cable.
	Interface defective.	Call DrägerService.
!!! **Mixer inop.**	Mixer malfunction. FiO_2 can deviate considerably.	**Immediately ventilate with separate manual ventilation device!** Call DrägerService.

Message	Cause	Remedy
! **Multi functional board inop.**	The multi-functional board for operating the nurse call or Remote Pad is faulty.	Confirm message with key »**Alarm Reset**«. Call DrägerService at the next opportunity. The original ventilation functions of Evita 2 dura are not affected. Correct functioning of the nurse call or Remote Pad is not guaranteed, however: remove the nurse call and/or Remote Pad.
!! **Multi functional board inop.**	The multi-functional board for operating the nurse call or Remote Pad is faulty.	Confirm message with key »**Alarm Reset**«. Call DrägerService at the next opportunity. The original ventilation functions of Evita 2 dura are not affected. Correct functioning of the nurse call or Remote Pad is not guaranteed, however: remove the nurse call and/or Remote Pad.
!!! **MV high**	The minute volume has exceeded the upper alarm limit.	Check condition of patient, check pattern of ventilation, correct alarm limit if necessary.
	Flow sensor not calibrated or faulty.	Calibrate flow sensor, page 51, replace if necessary.
	Water in flow sensor.	Drain water trap in hose system. Dry flow sensor.
	Machine malfunction.	Call DrägerService.
!!! **MV low**	The minute volume has fallen below the lower alarm limit.	Check condition of patient, check pattern of ventilation, correct alarm limit if necessary.
	Stenosis.	Check condition of patient. Check tube.
	Leak in breathing system.	Establish leakproof breathing system.
	Flow sensor not calibrated or faulty.	Calibrate flow sensor, page 51, replace if necessary.
	Machine malfunction.	Call DrägerService.
!! **Nebulisation interrupted**	Only in paediatric mode. Nebulisation is only possible in pressure-controlled ventilation or with AutoFlow®.	Select the patient mode. Restart nebulisation. Acknowledge the alarm with »**Alarm/Reset**».
	Only in paediatric mode, only for ventilation with AutoFlow®. Flow sensor not ready for measurement.	Switch on flow monitoring or calibrate flow sensor, page 51, or replace flow sensor or change mode. Restart nebulisation. Acknowledge the alarm with »**Alarm/Reset**»

Message	Cause	Remedy
! **Nebulizer on**	The medicament nebuliser is switched on, page 44.	Switch off the medicament nebuliser if necessary, page 46.
!!! **O_2 measurement inop.**	O_2 sensor provides invalid measured values.	Calibrate O_2 sensor, page 50, replace if necessary.
	O_2 measurement malfunction.	Call DrägerService.
! **O_2 monitoring off**	O_2 monitoring switched off.	Switch on O_2 monitoring again, as described on page 53, or immediately ensure an adequate monitor function.
!!! **O_2 supply down**	O_2 supply pressure too low.	Make sure pressure is greater than 3 bar.
! **O_2 supply down**	O_2 supply pressure too low. O_2 supply pressure is not required when FiO_2 = 21 Vol.%.	Make sure pressure is greater than 3 bar.
!! **O_2 supply pressure high**	O_2 supply pressure too high.	Make sure pressure is less than 6 bar.
! **O_2 supply pressure high**	O_2 supply pressure too high. O_2 supply pressure is not required when FiO_2 = 21 Vol.%.	Make sure pressure is less than 6 bar.
!!! **PEEP high**	Expiratory system obstructed.	Check hose system and expiration valve.
	Expiratory resistance is increasing.	Check bacterial filter. Replace if necessary.
	Machine faulty.	Call DrägerService.
!!! **PEEP valve inop.**	Internal PEEP valve faulty.	Call DrägerService.
! **Pressure limited**	Pmax pressure limit is active.	Check condition of patient, check pattern of ventilation, correct setting if necessary.
!!! **Pressure meas. inop.**	Fluid in expiration valve.	Replace expiration valve, page 86, then clean and dry.
	Pressure measurement malfunction.	Call DrägerService.
!!! **Standby activated**	Evita 2 dura has been switched to standby.	Confirm standby with »**Alarm Reset**« key.
!!! **Temperature high**	Breathing gas temperature higher than 40 °C.	Switch off humidifier.
!!! **Temperature meas. inop.**	Temperature sensor faulty.	Fit new temperature sensor, see page 90.
!!! **Temperature sensor ?**	Temperature sensor probe has been disconnected during operation.	Reconnect probe.
	Sensor cable broken.	Fit new temperature sensor, see page 90.

Message	Cause	Remedy
!!! Tidal volume high	The upper alarm limit of the applied inspiratory tidal volume VT has been exceeded during three consecutive ventilation strokes.	Check condition of patient, check pattern of ventilation, correct alarm limit if necessary.
	Leak or disconnection.	Check that hose system connections are leakproof.
! Tidal volume high	The inspiratory tidal volume VT has exceeded the upper alarm limit.	Check condition of patient, check pattern of ventilation, correct alarm limit if necessary.
	Leak or disconnection.	Check that hose system connections are leakproof.
!!! Tube blocked	Evita 2 dura only applies a very small volume with each mechanical stroke, e.g. because the tube is blocked.	Check condition of patient, check tube.
	Patient "fights" against the mechanical strokes in pressure-controlled ventilation, so that the set inspiratory pressure volume is achieved with only a very small volume.	Check condition of patient, check machine settings.
!! Volume not constant	Due to pressure limit or time limit, the set tidal volume VT has not been applied.	Prolong inspiratory time »T_{insp}« Increase inspiratory flow »Flow« Increase pressure limit »Pmax«. Press the »**Alarm Reset**« key to suppress the visual and acoustic alarm until the cause of the alarm is remedied.

Care

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Dismantling

Clean and prepare the machine after each patient.

Recommendation:
Change the hose system and expiration valve every 24 hours. Keep the replacement systems ready.

Observe the hospital hygiene regulations!

To avoid endangering hospital staff and other patients, the ventilator must be disinfected and cleaned whenever it has been used. Follow accepted hospital procedures for disinfecting contaminated parts (protective clothing, eyewear, etc.).

Removing parts

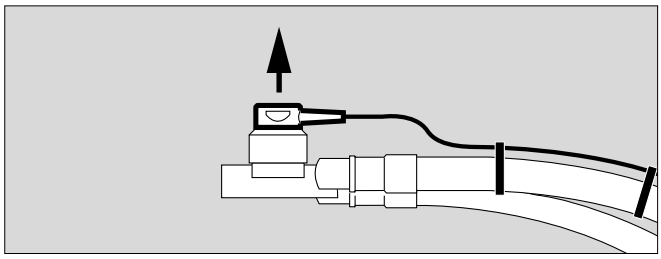
- Switch off the ventilator and humidifier, and remove their power plugs.
- Drain the water traps and ventilation hoses.
- Drain the water container of the humidifier.

Humidifier

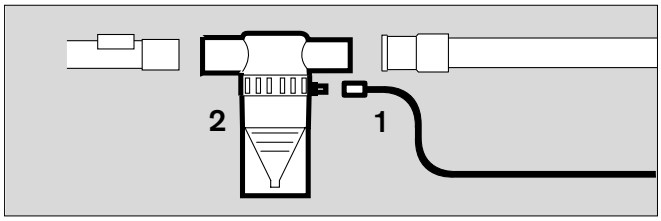
- Dismantle in accordance with the specific Instructions for Use and prepare for disinfecting/sterilising.

Temperature sensor (option)

- Remove the temperature sensor from the Y-piece – do not tug on cable. Remove the sensor probe from the back panel of Evita 2 dura.
- The temperature sensor is designed for wipe-disinfection.
  The temperature sensor is not suitable for autoclaving or immersion-disinfection.



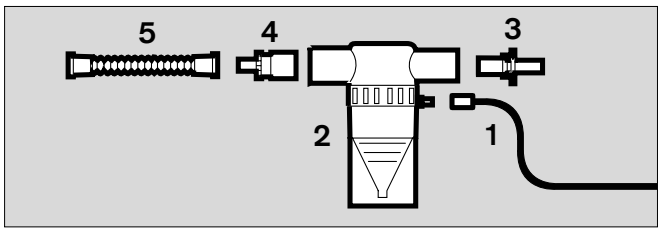
Medicament nebuliser (option)



1 Disconnect nebuliser hose from medicament nebulizer and from the port on the unit.

2 Disconnect the medicament nebuliser from the adult hose system or

2 from the paediatric hose system.



3 Remove catheter connector (ISO cone ø 15 / ø 11) from the inlet.

4 Remove the adapter (ISO cone ø 22 / ø 11) from the outlet.

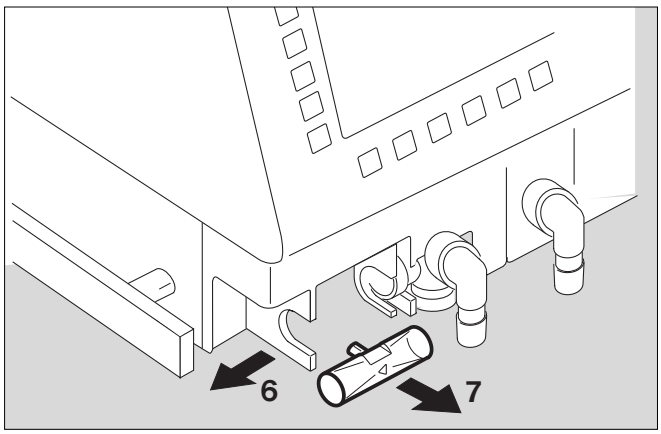
5 Remove the corrugated hose from the adapter.

- Dismantle the medicament nebuliser in accordance with its Instructions for Use.
- Prepare the individual parts of the medicament nebuliser and the adapter parts for cleaning and disinfection in the autoclave.

Ventilation hoses

- Remove ventilation hoses from the device ports.
- Remove the water traps from the ventilation hoses. Remove the water containers from the water traps.
- Prepare the ventilation hoses, water traps and associated water jars, and the Y-piece for disinfection and cleaning by autoclaving.

Flow sensor



6 Push the flow sensor to the left as far as it will go. and

7 pull out.

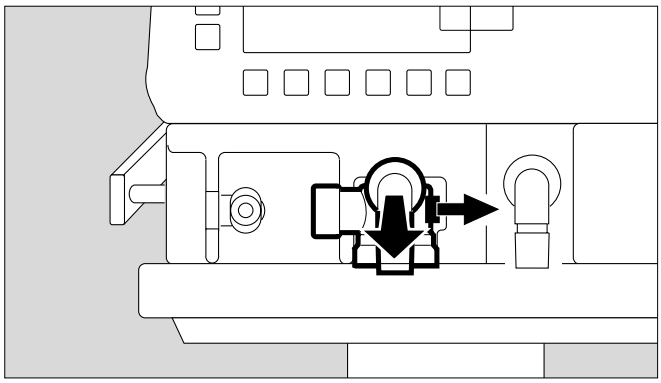
The flow sensor cannot be autoclaved or steam-sterilised.

- Disinfect flow sensor for about 1 hour in 70 % ethanol solution.
- **Expose the sensor to air for at least 30 minutes to allow the alcohol to evaporate. Otherwise the sensor could be damaged beyond control by ignition of any residual alcohol during calibration.**
- The flow sensor may be re-used as long as calibration can be carried out successfully.

s

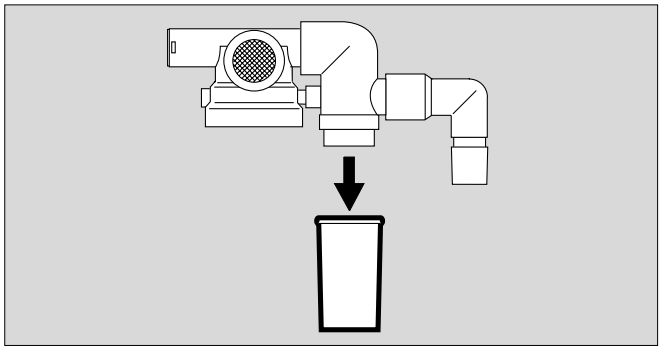
Expiration valve

- Push the catch to the right, pulling off the expiration valve at the same time.



If the expiration valve has an optional water trap:

- Remove the collecting jar.

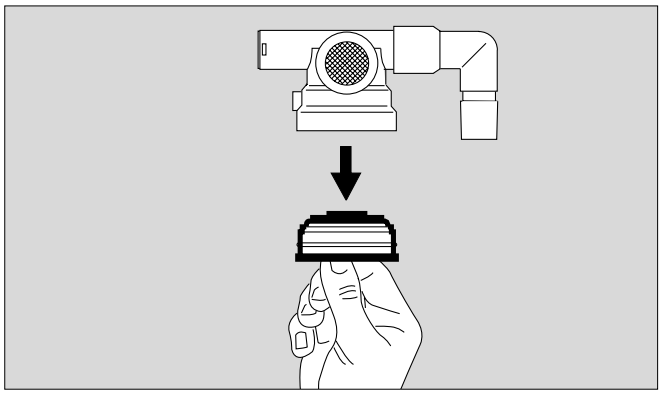


Only strip down the expiration valve if badly soiled:

- Unscrew stopper by hand and remove together with the diaphragm.
- Do not disassemble the expiration valve any further.
- The expiration valve is suitable for disinfection and cleaning by autoclaving

and

- for steam-sterilisation.



Disinfecting/Cleaning/Sterilising

Use surface disinfectants. For surface compatibility, use disinfectants based on:
– aldehydes,
– quaternary ammonium compounds.

To avoid the possibility of damage to material,
do not use any disinfectants based on:
– alkylamine-based compounds
– phenol-based compounds,
– halogen-releasing compounds,
– strong organic acids,
– oxygen-releasing compounds.

For users in the Federal Republic of Germany, we recommend that only disinfectants on the current DGHM list are used (DGHM: German Society for Hygiene and Microbiology).
The DGHM list (published by mhp-Verlag, Wiesbaden) also classifies each disinfectant by its active agents.
For countries where the DGHM list is not available, we recommend the types of disinfectant given above.

Disinfectants often contain – besides their main active agents – additives that can also damage materials.
If in doubt, ask the supplier/manufacturer of the disinfectant/ cleaning agent.

Parts must not be sterilised in ethylene oxide – health hazard!

To avoid endangering hospital staff and other patients, the ventilator must be disinfected and cleaned whenever it has been used. Follow accepted hospital procedures for disinfecting contaminated parts (protective clothing, eyewear, etc.).

Ventilator without ventilation hoses, gas supply hoses, temperature sensor

Wipe disinfect

- e.g. with Buraton 10 F or Terralin (Schülke & Mayr, Norderstedt, Germany).
  Comply with the manufacturer's instructions.

Cooling air filter, room air filter

- Filters must be cleaned or replaced when soiled or at the latest after 4 weeks, see page 107.

Ventilation hoses, water traps and their collectors, Y-piece, expiratory valve (or in the event of severe soiling, its individual components)

- Disinfect in a moisture saturated environment at 93 °C (200 °F) for 10 minutes using a cleaning and disinfecting machine. **Use detergent only.**
- After disinfecting with moist heat, we recommend that the **expiratory valve or its disassembled components** be autoclaved at **134 °C** (273 °F) to remove any remaining liquid in the pressure measuring canal in the block.

Alternatively,

if a washing machine is not available:

- **Bath disinfect,** e.g. with Sekusept from Henkel. Comply with the manufacturer's instructions.

  Then rinse with clean water, preferably from a soft water supply. Shake water out thoroughly, and leave the products to dry.

Expiratory valve or its disassembled components
after rinsing

- Autoclave **at 134 °C** (273 °F).

Alternatively:

Expiratory valve

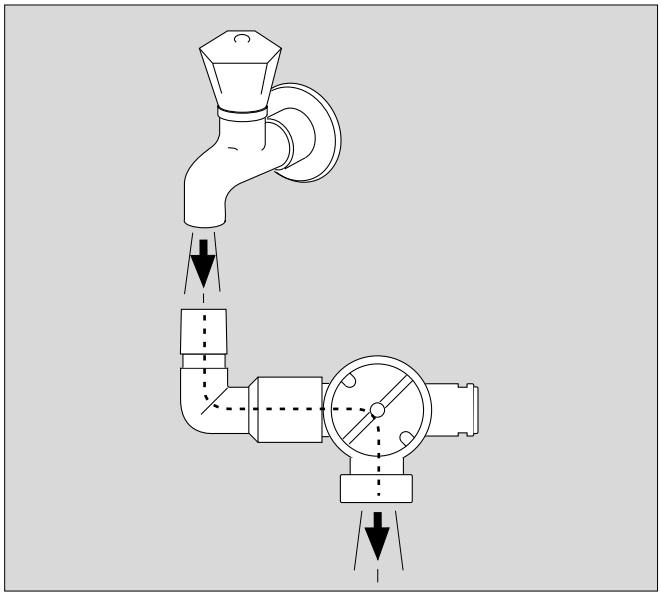
- Rinse with clear water, preferably soft water. Shake thoroughly to remove all remaining water.
- Thoroughly dry expiratory valve after rinsing.
- Autoclave at 134 °C (273 °F) after drying.

Ventilation hoses, water traps and their collectors, Y-piece, expiratory valve, temperature sensor

- Can be autoclaved at 134 °C (273 °F).

Humidifier

- Prepare in accordance with separate Instructions for Use.



Disinfecting / cleaning / sterilising schedule for Evita 2 dura Intensive Care Ventilator

Applicable for use with non-infectious patients.
For infectious patients, all parts that conduct breathing gas must be additionally sterilised after disinfecting and cleaning.
The parts listed here can be sterilised – see "Sterilising" column.

Part Reusable components	**How often** Recommended cleaning intervals[1)]	**How** **Disinfecting and cleaning**			**Sterilising**
		Autoclaving at 93 °C 10 minutes	Wiping	Bath immersion	Steam 134 °C 10 minutes
Evita 2 dura basic device	per patient	no	outside	no	no
Trolley Hinged arm Medical gas hoses	per patient	no	outside	no	no
Ventilation hoses, Y-piece, Water traps, Collecting jars	daily	yes	no	possible	yes
Expiration valve	per patient, weekly	yes[3)]	no	possible	yes
Temperature sensor Flow sensor	daily	no no	yes outside	no possible[2)]	yes no

1) This table contains guideline values only.
The protocols of the responsible hospital hygiene official remain unaffected!

2) Special treatment, see page 81.

3) After disinfecting / cleaning: sterilise at 134 °C.
Otherwise risk of malfunction due to residual liquid in pressure measuring line.

Assembling

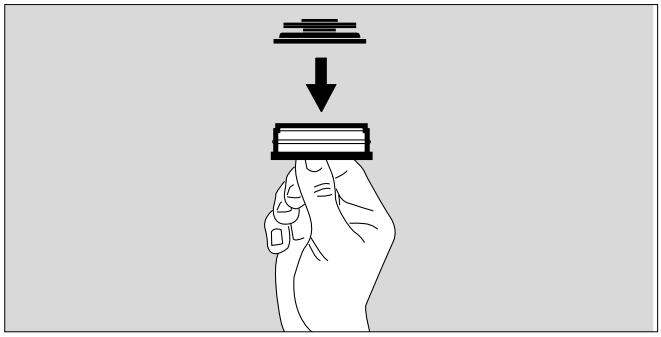
Only use duly prepared components!

Mounting the expiration valve

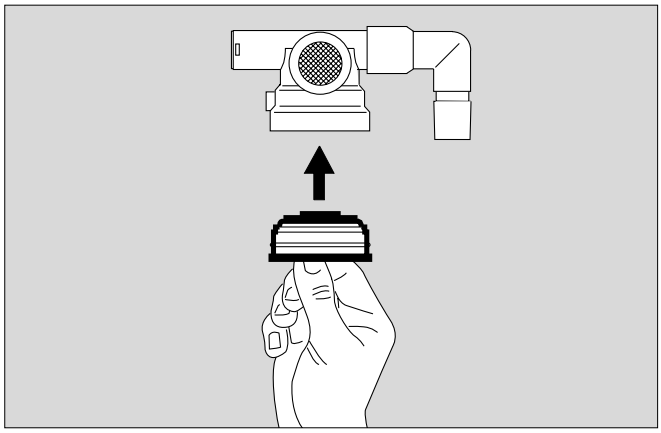
The parts must be entirely dry to prevent malfunctioning.

Be careful to fit the diaphragm in the correct position.

- Hold stopper by the flange and place diaphragm on the collar of the stopper.

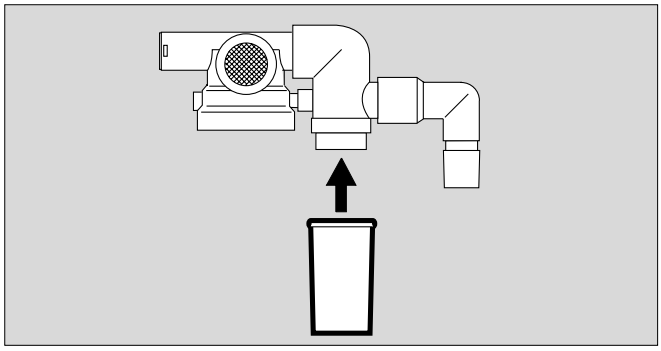


- Insert stopper with diaphragm on top into the housing from below and screw in tightly.



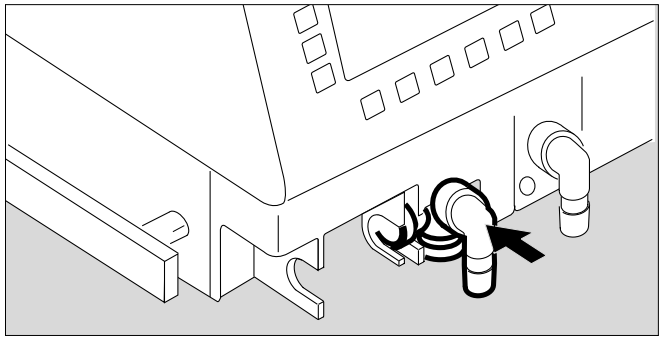
If the expiration valve has an additional water trap:

- Fit collecting jar.



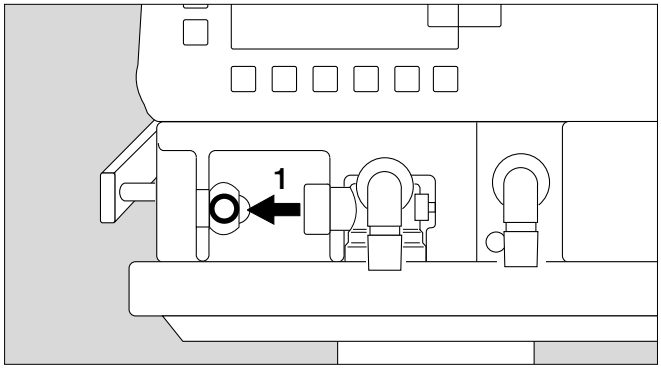
Inserting the expiration valve

- Push the expiration valve into its connection until it clicks into place. Check that it is blocked in position by tugging lightly on the connector.



Fitting the flow sensor

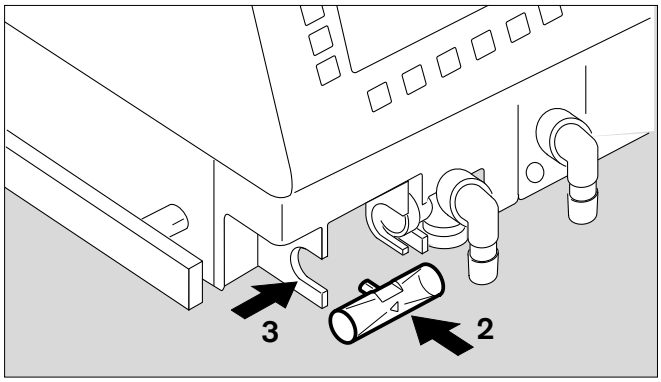
1 Push the socket to the left as far as it will go.



2 Insert the flow sensor – with the probe facing towards the ventilator – into the mounting and push it into the socket as far as it will go.

Then:

3 Push flow sensor to the right as far as it will go into the rubber lip of the expiration valve.



Fitting the O_2 sensor

– when using the system for the first time
– when the display reads:
O_2 measurement inop
– when calibration can no longer be performed.

1 Turn port downwards or to the left.

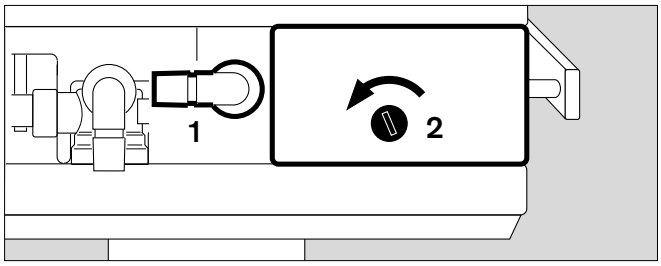
2 Unscrew (e.g. with coin), and remove protective cover.

3 Unscrew the two knurled screws and open the sensor housing.

4 Insert new sensor. The sensor end with the visible circular tracks on the contacts goes into the housing.

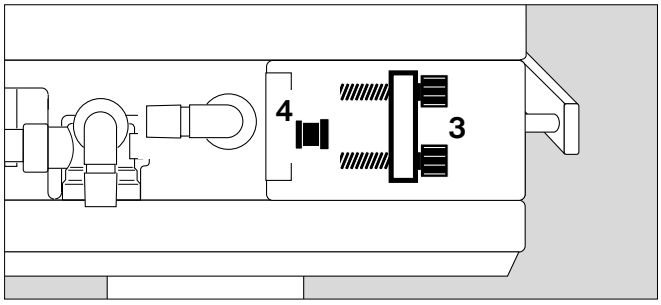
3 Close the sensor housing securely with the two knurled screws.

- Screw the protective cover back in place.



After inserting:

- Wait 15 minutes for the O_2 sensor to warm up. The O_2 sensor cannot be calibrated until it has warmed up.
- Manually calibrate the O_2 sensor, see page 50.
- Used sensors can be returned to Dräger for disposal.



Note on the use of heat and moisture exchangers

The use of a heat and moisture exchanger (HME) ("artificial nose") in the patient connection can increase breathing resistance considerably. An increase in breathing resistance will in turn lead to greater effort in spontaneous breathing and/or greater trigger effort during assisted ventilation. Under unfavourable conditions, an increase in breathing resistance can lead to an unwanted intrinsic PEEP.
This breathing resistance in the patient connection cannot be directly monitored by the ventilator.
Therefore:

- The condition of the patient and the ventilator's measured values for air volume and resistance must be checked more frequently.
- Follow the Instructions for Use of the heat and moisture exchanger (HME).
- **Do not use the heat and moisture exchanger HME) at the same time as a medicament nebuliser or humidifier!**

Note on the use of bacterial filters

The use of expiratory or inspiratory bacterial filters on the ventilator is not recommended.

However, if bacterial filters are nevertheless used on the expiration side, an undesirable increase in breathing resistance is possible.
Especially during medicament nebulisation and humidifying, the resistance of the expiratory bacterial filter may increase gradually. For the patient, the effect may be increased breathing effort and intrinsic PEEP.

An intrinsic PEEP can be recognised by the fact that the expiratory flow does not return to "0" before the end of expiration.

If PEEP is unacceptably high, the unit signals the »**PEEP high**« alarm.

- Check the bacterial filter and replace it if it is the cause of the PEEP.

The inspiratory and expiratory breathing resistance of the patient system can be determined before ventilation by the device check in standby mode – see page 97 onwards.

For ventilating adults and children

From 100 mL tidal volume VT in »**Adult**« patient mode

Connecting Aquapor humidifier

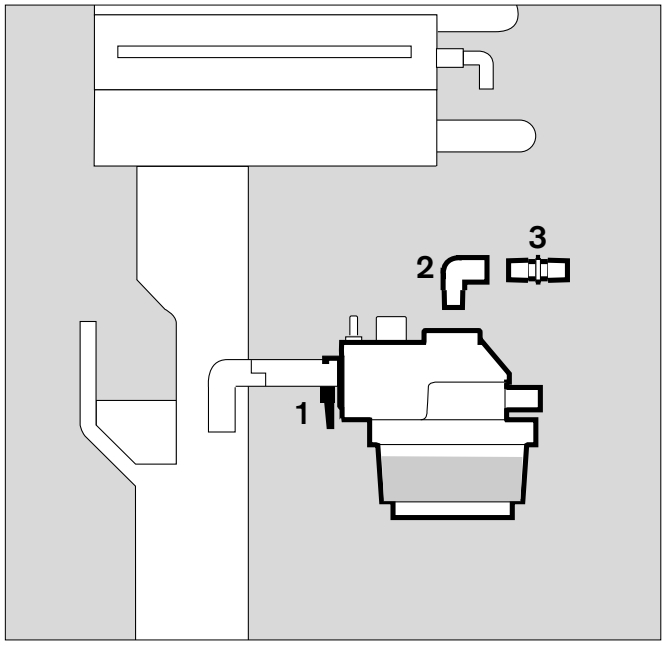
- Prepare Aquapor according to its separate Instructions for Use.

1 Hang Aquapor from rail by bracket and tighten screws.

2 Insert elbow connector into Aquapor.

3 Insert the double connector into the elbow connector.

- Fill Aquapor bowl to the upper mark with distilled water.



- **If using a breathing gas humidifier, do not use an additional heat and moisture exchanger (HME). Risk of increased breathing resistance due to condensation. Remove the ventilation hoses.**

Do not use antistatic or conductive hoses*.

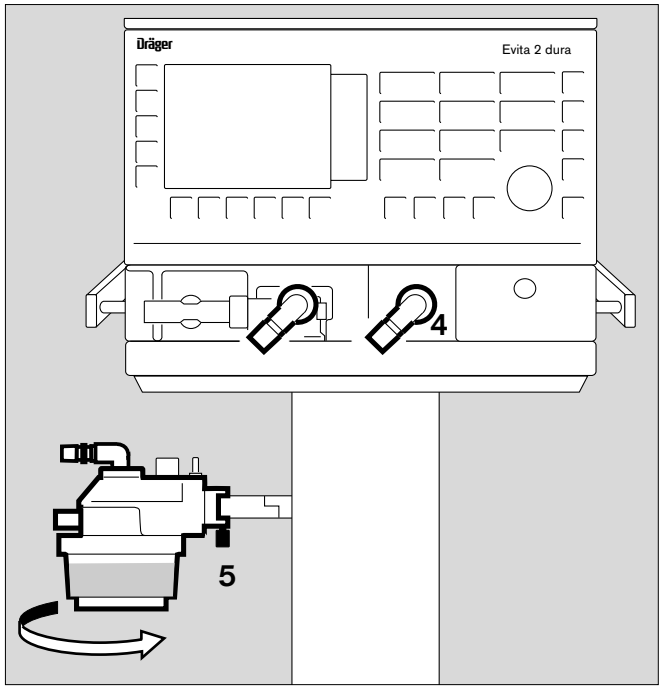
Depending on the desired position of the ventilator in relation to the bed, the hinged arm can be fitted to either side of the machine.

Attachment on **left-hand** side:

4 Turn both ports to the left.

5 Turn Aquapor to the left.

The following description applies when the ventilation hoses have been attached on the **left-hand** side.



* DIN VDE 0750 Part 215:
The use of anti-static or electrically conductive material in the breathing system of the lung ventilator is not considered to contribute any improvement in safety. On the contrary, the use of these materials increases the danger of electric shock to the patient and of fire due to the presence of oxygen.

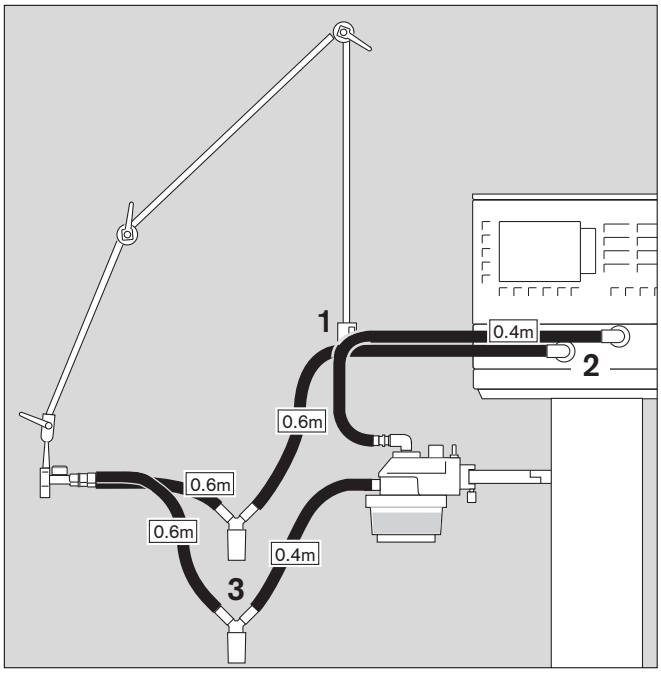
1 Hang the hinged arm from the rail on the left-hand side and tighten screws.

- Connect ventilation hoses, and note length of hose (metres).

2 Turn ports in direction of hoses.

3 Install water traps in vertical position at the lowest point of their hose lines.

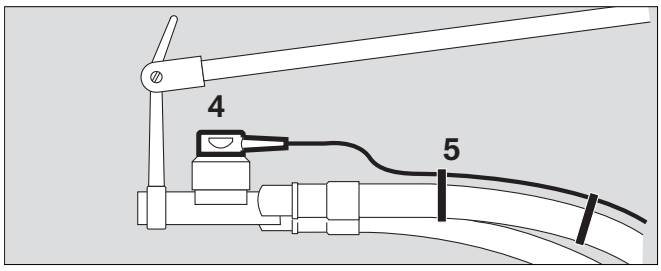
- Connect the Y-piece, with the rubber sleeve of the Y-piece on the inspiratory side.



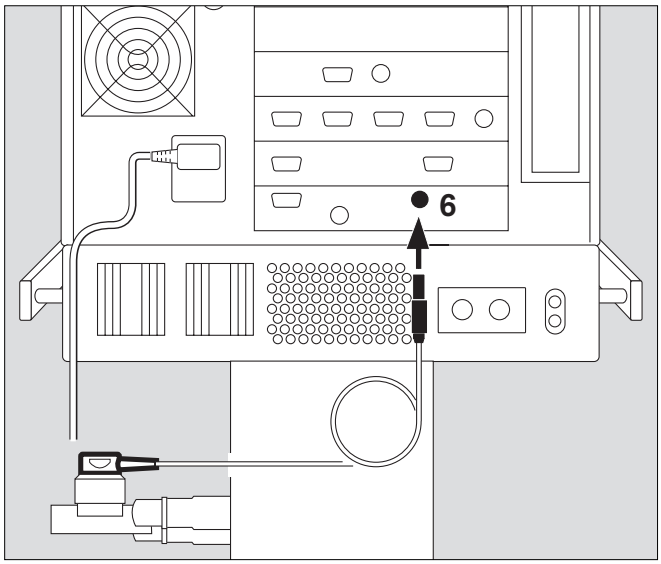
Fitting the temperature sensor (option)

4 Push the sensor as far as it will go into the rubber sleeve on the inspiratory side of the Y-piece. Align the Y-piece so that the sensor is on top.

5 Attach the sensor cable with hose clips.



6 Insert the probe of the temperature sensor into the socket at the rear of the unit.

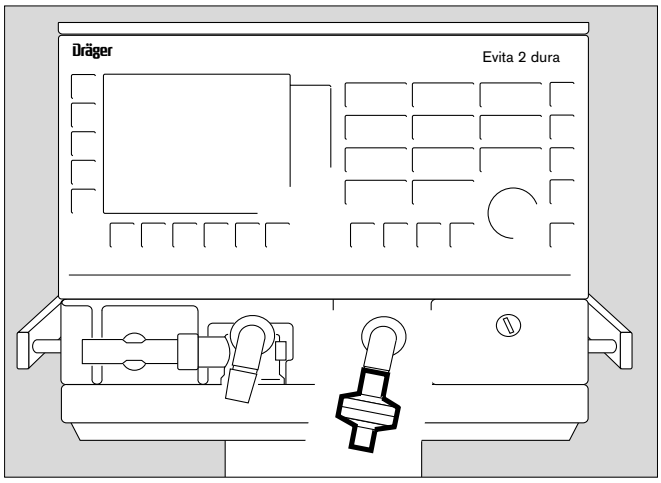


For ventilating infants

up to 300 mL tidal volume VT in »**Ped.**« patient mode.

Fitting humidifier and ventilation hoses

- Fit the bacteria filter to the inspiratory port.



- **Do not use a heat and moisture exchanger (HME) at the same time as a humidifier.**
  Risk of increased breathing resistance because of condensation.

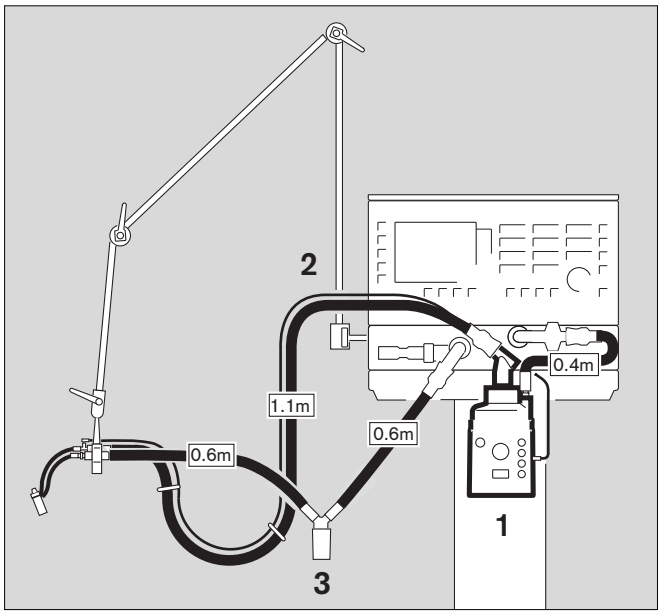
- Prepare the "Fisher & Paykel MR 730" humidifier in accordance with the separate Instructions for Use, using hose set K (paediatric), as supplied.

1 Hang the humidifier with a bracket to the mounting below the machine and tighten the screws.

2 Hang the hinged arm with a bracket to the rail on the left-hand side, and tighten the screws.

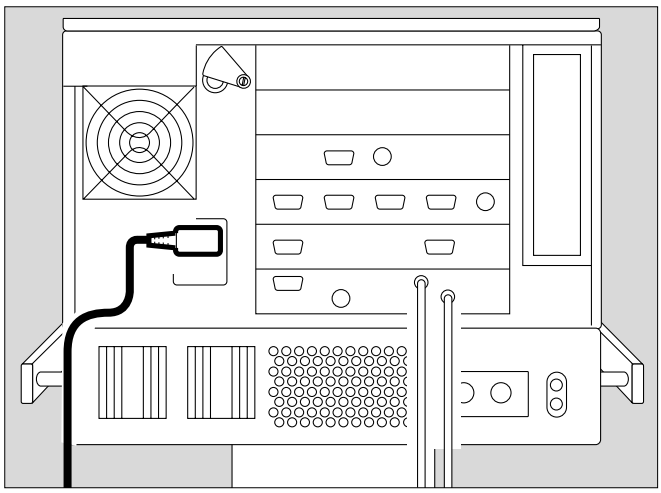
- Connect the ventilation hoses, and note their length (in metres).

3 Place the water trap in the vertical position.



Supply and Connections

Electrical power supply



The ventilator is designed for a mains voltage of

either : 220 V to 240 V, 50 / 60 Hz
or : 100 V to 127 V, 50 / 60 Hz

The built-in power adapter of the Evita 2 dura automatically adapts to the mains supply.

- Insert the plug in the mains socket.

For operation with the accessory "built-in DC power unit 12 / 24 V – Evita 4 DC" and external battery (option).

Either : 12 V
or : 24 V

- Follow the Instructions for Use of the "Evita 4 DC".

Note on the use of a socket strip

Connecting other devices to the same extension socket strip may, in the event of earth failure, cause the current leakage to the patient to increase beyond the permissible values.
In this case, the risk of electric shock cannot be eliminated.

Temporary interruption of power supply

e.g. when switching on the reserve power supply

Without the built-in DC power unit (12/24 V – Evita 4 DC):

During the power failure, Evita 2 dura will output a continuous tone for max. 2 minutes.
This continuous tone may be output for a shorter period if Evita 2 dura was switched on for less than 15 minutes.

Evita 2 dura tolerates power interruptions shorter than 10 milliseconds – without any effect on ventilation.
In the case of power failures lasting longer then 10 milliseconds, the machine restarts with a short self-test lasting about 4 seconds – ventilation is continued with the same values that were set before the power was interrupted.
If a lower alarm limit has been set for the minute volume, the **MV low** alarm is activated until the measured value has risen above the lower alarm limit.

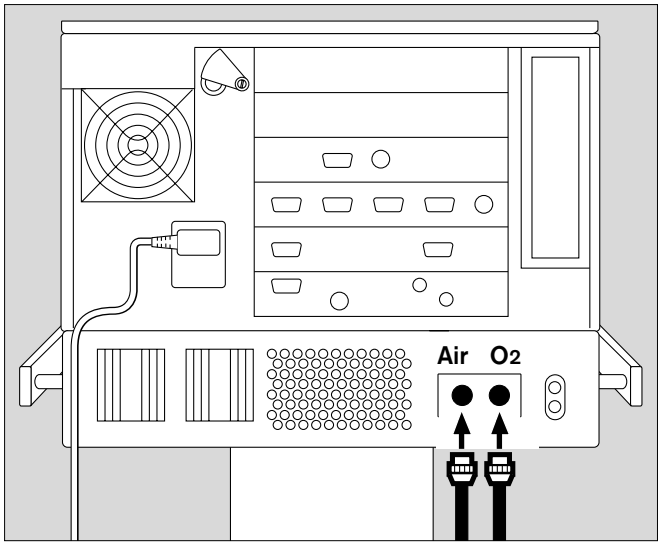
With 12/24 V DC power supply (optional):

Follow Instructions for Use of Evita 4 DC option (DC power supply)

Gas supply

The compressed gases must be free of dust and oil and must be dry. Gas pressure must be 3 to 6 bar.

- Screw the connecting hoses for medical air and oxygen to the back panel of Evita 2 dura and insert their probes into the terminal units.

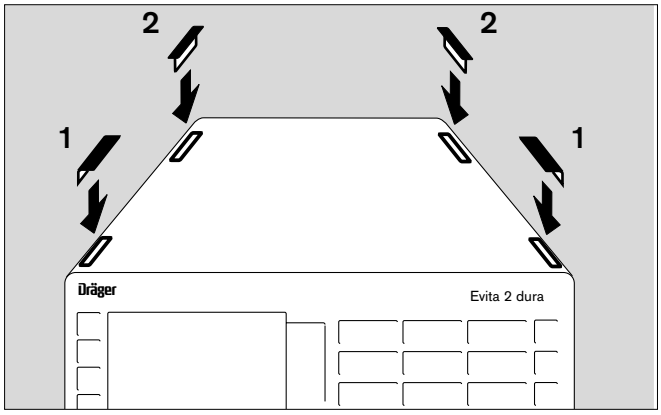


If no instrument tray (option) **is fitted to the device**

Seal off the slits in the top panel with the rubber plugs:

1 Press the round plugs in the front slits – rounded part facing outwards.

2 Press the flat plugs into the rear slits.



Do not place any liquid container (e.g. infusion container) above or on top of the Evita 2 dura.
Any leak, spill or seepage could prevent it working properly.

Evita Remote

Optional remote control unit (Remote Pad)

The kit may only be installed and programmed by specialists.

For parallel, remote operation of the following LED and key functions:

1 Red LED – to indicate warning messages

2 Yellow LED – to indicate caution and advisory messages

3 »🔔« key – to suppress the alarm tone for approx. 2 minutes

4 »**Alarm Reset**« key – to acknowledge alarm messages

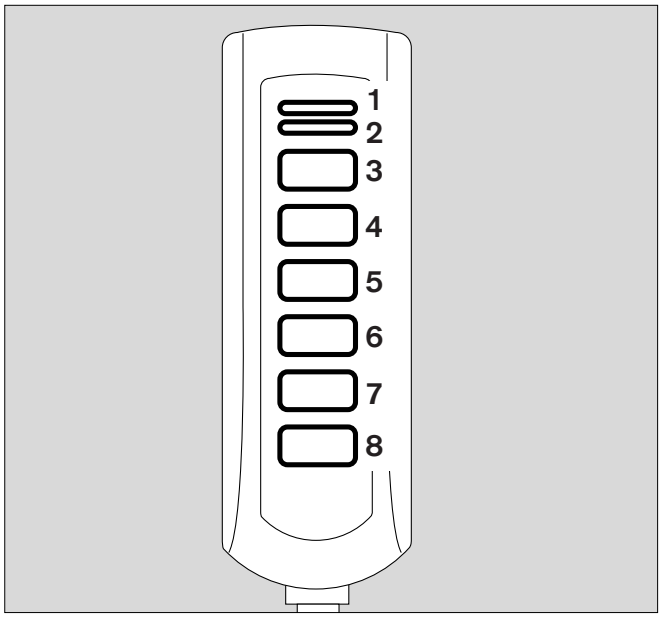
5 » **Neb.**« key – to start and end medicament nebulisation

6 »**O_2 suction**« key – for bronchial suctioning

7 »**Insp. hold**« key – for sustained, manually induced inspiration

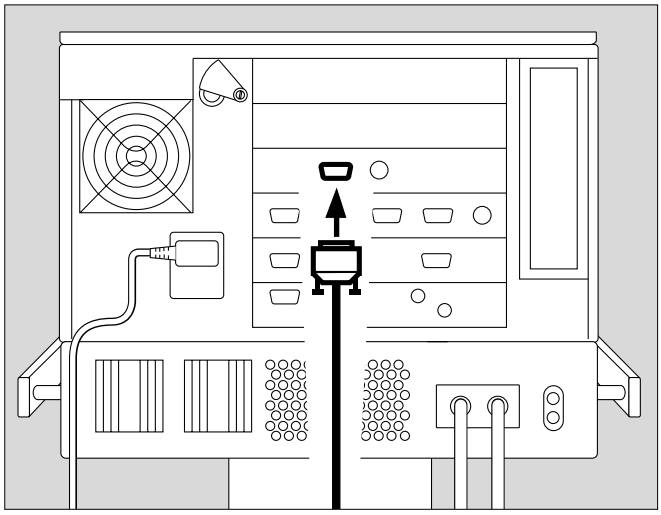
8 »**Exp. hold**« key – for extended and sustained expiration

The function of the respective LEDs and keys is the same as that of the corresponding elements on the front panel of Evita 2 dura and is described in the application chapters of the Instructions for Use.

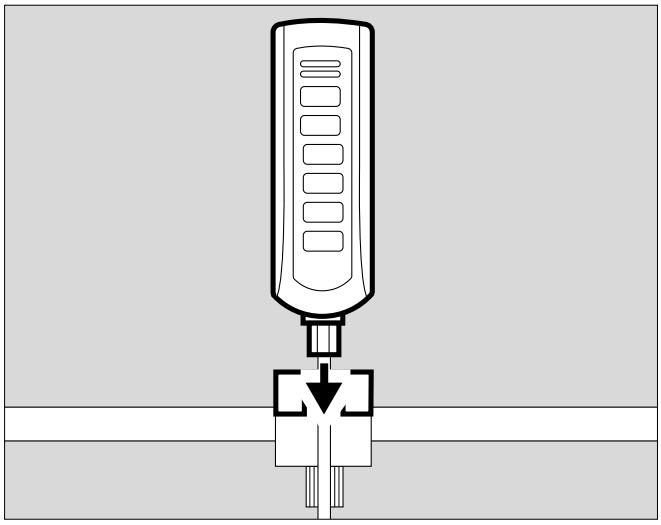


Connection

- Plug the lead of the Remote Pad into the socket »⎍« on the rear of Evita 2 dura. The plug can be connected or disconnected at any time without impairing operation of Evita 2 dura.



- Hook holder onto a standard rail and clamp into place.
- Hang Remote Pad into holder from above.



Note automatic self-test

– when connecting the Remote Pad to Evita 2 dura while the latter is switched on

or

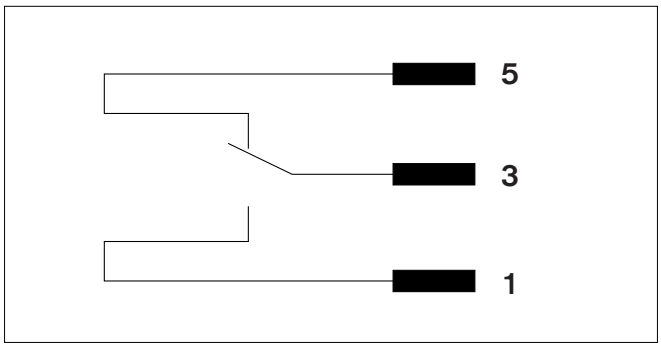
– when switching on Evita 2 dura after connecting the Remote Pad.

- Do not press any keys on the Remote Pad.
- All LEDs on the Remote Pad light up for 5 seconds:
  – Red LED
  – Yellow LED
  – Yellow LEDs in the keys
- The Remote Pad is tested by Evita 2 dura. An advisory message is output if a fault is detected, see page 71 "Fault – Cause – Remedy".

Nurse call
(optional)

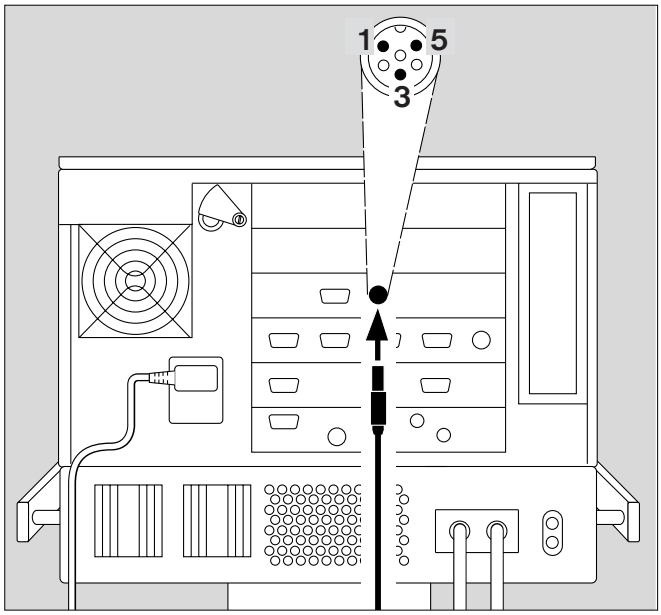
Connection on the rear panel of Evita 2 dura for transmitting top-priority alarm signals to a central hospital alarm system.

- The kit may only be installed by specialists.
- The 6-pin round DIN plug (female connector) must be connected to the lead for the central alarm station in the hospital by a specialist.



Connection 3-5 makes and the nurse call is activated as soon as Evita 2 dura signals an alarm.

- Plug the connector into the » « socket on the rear and screw into place.
- Check correct operation of connected nurse call system.



Only alarm messages of the highest priority (see page 38) are transmitted via nurse call.

Alarm messages are indicated in red with three exclamation marks in the top field of the screen, see page 38. Caution and Advisory level messages are not transmitted. The nurse call is activated also when the internal loudspeaker in the ventilator is faulty.

Connection of a nurse call does not relieve staff of their duty to check the monitoring on the Evita 2 dura screen at regular intervals.

- **Screen displays must be checked regularly.**

A fault in any of the components in the link between nurse call and central hospital alarm system (e.g. in the electronics for nurse call in Evita, in the Evita power supply, or in the alarm generator of the central hospital alarm system) may result in failure of the nurse call.

Background: The hospital connections to the central alarm typically use only one channel. The electronics for nurse call consequently also uses only one channel.

Technical Data

Floating DC contact	
Input voltage	Max. 40 V =
Input current	Max. 500 mA
Switching capacity	Max. 15 W

Before Using for the First Time

- Check that the device is ready for operation, see "Device Check", starting on page 97.

Device Check

Before using on the patient

Immediately before using on the patient, check that the machine is working properly and is ready for operation. Evita 2 dura supports this "device check" by means of a built-in checklist that guides the user through the test in dialogue mode.

The following functions are performed during this device check:

System:
– Expiration valve
– Flow sensor
– Full level of the humidifier
– Completeness of hose assembly

Function:
– Air-O_2 change-over valve
– Safety valve
– Gas supply
– Auxiliary alarm (triggered if alarm generator fails)
– Lamps/LEDs

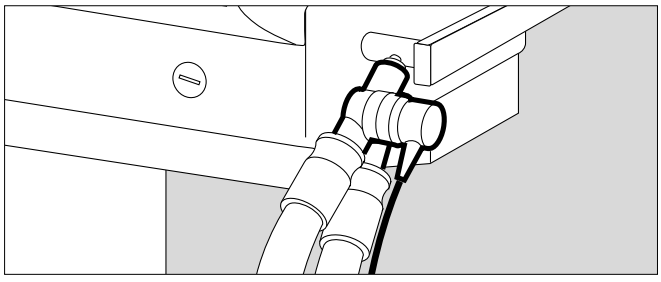
Sensors:
– Calibration of flow sensor
– Calibration of O_2 sensor

Leakproofing:
– Leakage
– Compliance
– Resistance

The test results determined by the device check and the sensor calibration values remain in memory, until the next calibration, even when the device is switched off.

Preparing the device check

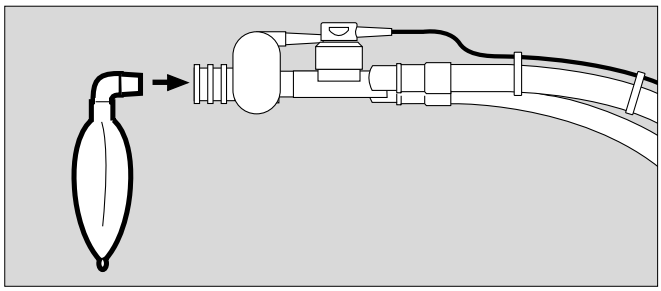
- Place the Y-piece on the holder on the right-hand side of the machine.



Preparing the adult test lung 84 03 201

for the adult hose system

The test lung consists of an elbow connector for connection to the Y-piece, a 7 mm diameter catheter connection for simulating the resistance of the airways and a 2 litre breathing bag to simulate compliance.



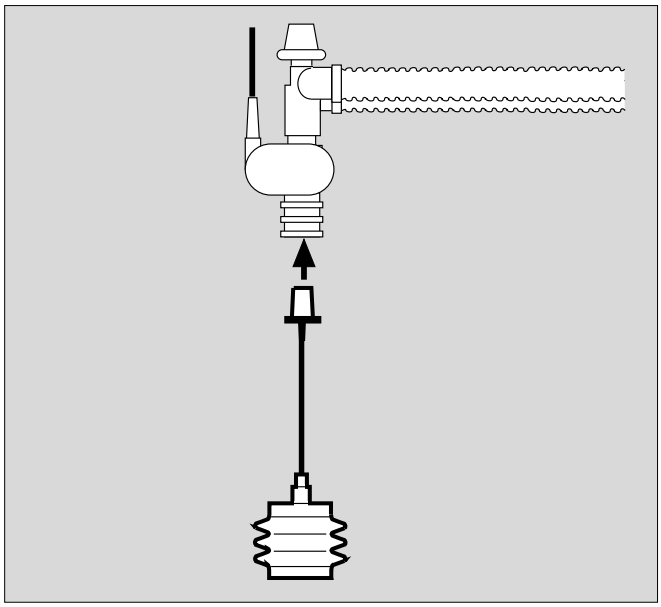
- **Overextended breathing bags must not be used as they may cause artefacts during the device check!**
- The elbow connector must not be plugged into the patient connection of the Y-piece until directed by Evita 2 dura.

Preparing the child test lung 84 09 742

for the paediatric hose set

The test lung consists of a tracheal tube CH 12 to simulate the resistance of the airways and a small bellows to simulate compliance.

- Only insert the elbow connector into the Y-piece when Evita 2 dura advises you to do so on the screen.

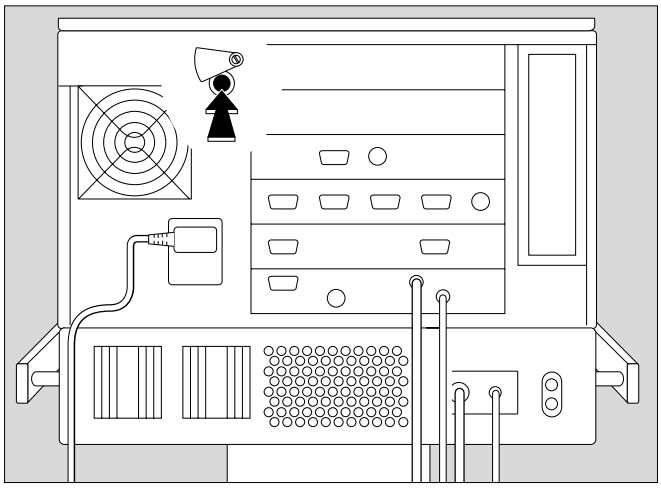


Performing the device check

- Switch on the machine = press power switch on the back panel until it clicks into position.

Evita 2 dura runs through its self-test procedure.

- Wait until the 10-second test phase has been completed.



After the self-test:

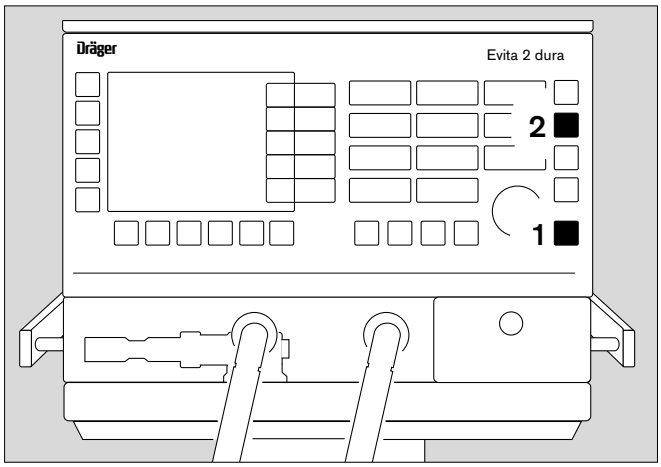
1 Switch Evita 2 dura to standby = Hold down key »⏻« for about 3 seconds.

The audible standby alarm tone is sounded.

2 Switch off the standby alarm tone with the »**Alarm Reset**« key.

The standby alarm tone cannot be switched off with the »🔕«key.

- Press the »**Check ▶▶**« menu key.



Before starting the check, enter the type of humidifier selected:

– Active humidifier, e.g. Dräger Aquapor
  or
– HME/Filter (artificial nose)

If the type of humidifier is known, Evita 2 dura can take the temperature and moisture situation into account when measuring the volume parameters.

- Touch the »**Humid.**« screen key.

- Touch the »**Active Humid.**« screen key

  or

- Touch the »**HME/Filter**« screen key.
- Confirm selection = press rotary knob.

The selected type of humidifier is indicated by a black dot in the corresponding screen key.

The humidifier selection is saved and remains effective even when the equipment is switched on again.

If the type of humidifier is changed and has to be reselected on the screen, the following test steps are shown to be invalid (– –) after the device check:

– Humidification
– Air tight check

The operator is prompted to repeat the device check for these two steps.

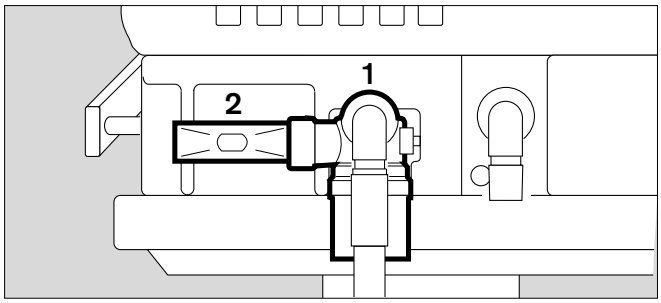
Start the check procedure:

- Press the »**Check ▶▶**« screen key.
- Activate the »**Start**« screen key = press rotary knob.

Evita 2 dura starts with the dialogue-oriented check.
The check procedure is semi automatic.
The Evita 2 dura user is instructed to carry out specific actions on the device.

Device

Expiration valve



1 Correctly inserted and seated?

- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

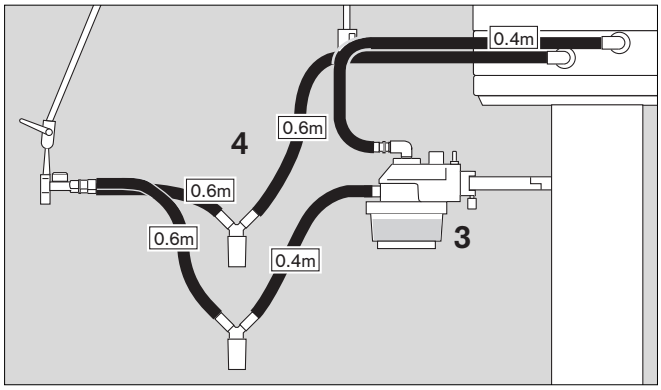
Correct functioning of the expiration valve is checked by Evita 2 dura.

Flow sensor

2 Correctly installed?

- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

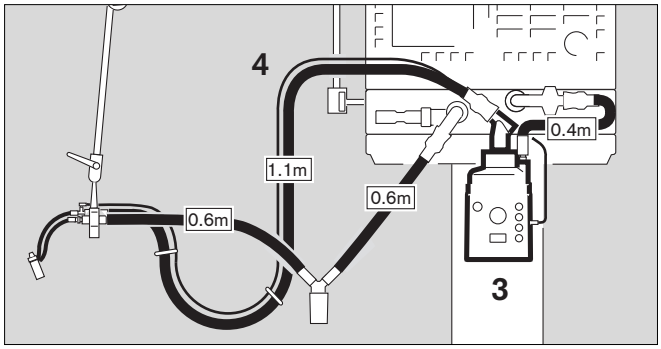
Humidifier level



3 Sufficient Aqua dest level?
Humidifier ready for operation?

- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

Hose routing



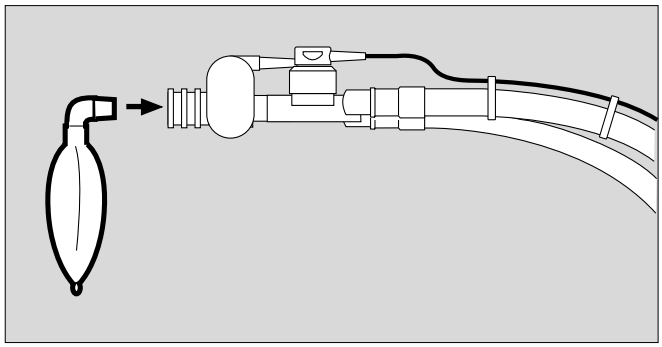
4 Hose system correctly assembled?

- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

Air-O_2 changeover valve

- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

- Connect adult test lung to the Y-piece.
- **Do not use an overstretched breathing bag, because it may cause artefacts during the device check.**
- Confirm the »**Yes**« screen key = press the rotary knob.
- Disconnect the O_2 connector.
  The system checks that the air/O_2 changeover valve is functioning correctly.



Safety valve

- Connect the O_2 connector. Disconnect the medical air connector.
- The machine detects the shortage of medical air.
- Reconnect the medical air connector.

Gas supply

- The machine checks that the connectors for medical air and O_2 are connected.

Auxiliary alarm

- Is the alarm tone sounded?
- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

Lamp test

- Do all lamps/LEDs light up?
- Select the »**Yes**« screen key = turn the rotary knob. Confirm = press the rotary knob.

Flow sensor calibration

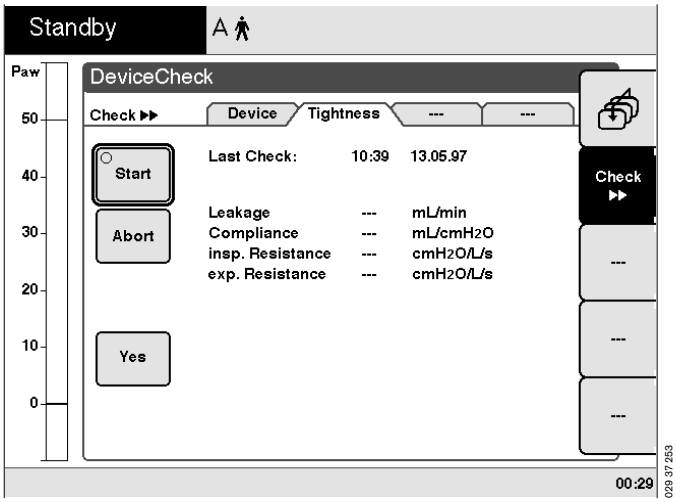
Automatic

O_2 sensor calibration

Automatic

Leakproofing

- With the »**Check ▶▶**« menu button, select the »**Tightness**« menu.
- Activate the »**Start**« screen key = press the rotary control.



Leakage

- The device determines leakage in L/min with reference to a pressure of 60 mbar.

The »**Tightness**« test procedure can also be selected separately.

In Standby mode:

- Press the »**Check ▶▶**« menu key.
- With the »**Check ▶▶**« menu button, select the »**Tightness**« menu.

Corrective action can be taken with the aid of the leakage display.

Compliance

- The machine calculates system compliance in mL/mbar.

The volume-controlled ventilation strokes and the measured values from flow monitoring are automatically corrected by the calculated system compliance.

After changing the hose system:

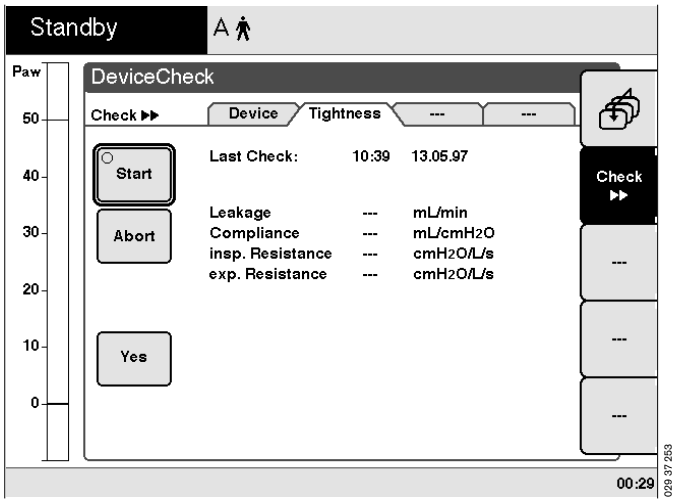
- Repeat the leakage test.

Resistance

- The machine calculates the sum of inspiratory and expiratory resistance in mbar/L/s.

On completion of the device check, a checklist is displayed on the screen to show the results of the check.

Correct result : ✓
Incorrect result : F
Check not performed : – –



In the event of incorrect results, e.g. if the hose system is not sufficiently leakproof:

- Eliminate the cause of the fault
- Select the »**Repeat**« screen key = turn the rotary knob.
  Activate = press the rotary knob.

Only the tests with incorrect results are repeated.

For immediate operation (e.g. in an emergency) the device check can be interrupted:

- Press the » ⏻ « key. The device immediately starts ventilation.

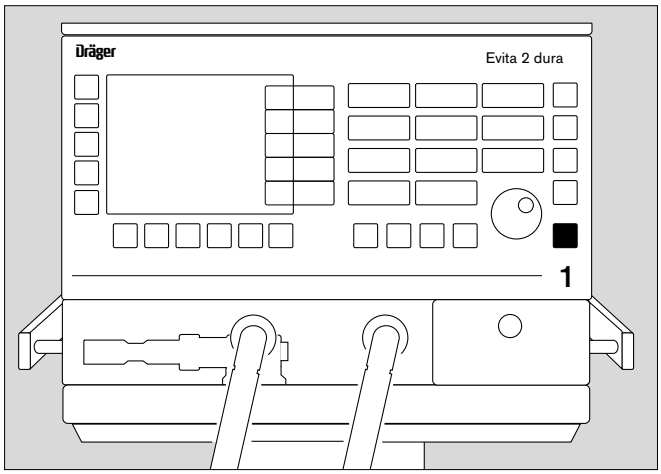
After successful completion of the device check, Evita 2 dura is ready for operation.

Either:

- Leave Evita in Standby mode and if necessary preselect the ventilation mode and ventilation parameters.

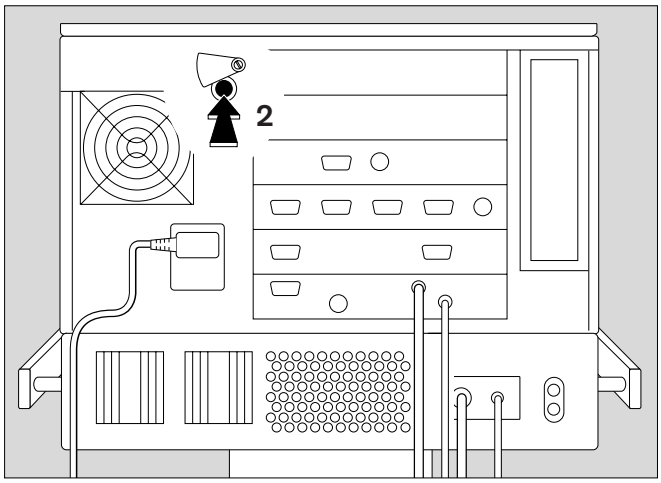
or:

1 Immediately start up Evita 2 dura, press » ⏻ «,



or:

2 Switch off Evita 2 dura for later use. Switch on back panel = pivot the cover-flap to the side, press button in as far as it will go and release.



Checking the hose system for leaks

The hose system is tested for leaks during the device check but must also be monitored independently of the device check, e.g. after changing the hose system.

- Select the menu »**Leak tightness**« via the menu button »**Check ▶▶**«.
- Activate screen key »**Start**« = press rotary knob.

During the test, the current leakage flow is continuously displayed.
A leakage flow of 300 mL/min at a pressure of 60 mbar is permitted.

After the leak test, the Evita 2 dura unit determines the compliance and resistance of the hose system.

The calculated compliance of the hose system is used by Evita 2 dura for automatically correcting the volume controlled ventilation strokes and the measured values of the flow monitoring system, see page 118.

The calculated resistance of the hose system is used by Evita 2 dura to correct the pressure measurement in the presence of a basic flow (NeoFlow option).

When changing the patient mode or type of humidifier, the device automatically sets the hose compliance and resistance to the default values.

By checking the system for leaks, the device determines the momentary compliance and resistance.

Therefore:
When changing the patient mode, hose system or type of humidifier:

- Always perform the leak test!

Maintenance Intervals

Clean and disinfect equipment and / or components before any maintenance procedures – and before returning for repair!

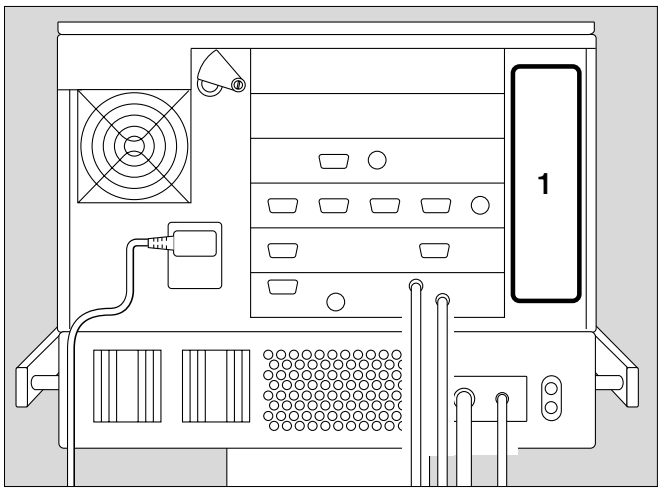
O_2 sensor	replace when the following message is displayed: **O_2 measurement inop** and when calibration is no longer possible. Spent O_2 sensors can be returned to Dräger for disposal.
Ambient-air filter	Clean or replace after 4 weeks, see below and page 108. Dispose of as domestic waste.
Cooling-air filter	Replace after 1 year. Dispose of with normal domestic waste.
Filters in the compressed gas inlets	To be replaced by trained service personnel every 2 years.
Lithium battery for data protection	To be replaced by trained service personnel every 2 years. Disposal: see page 108.
Real-time clock	To be replaced by trained service personnel every 6 years. Disposal: see page 108.
Pressure reducer	To be replaced every 6 years by DrägerService.
Equipment inspection and service	Every 6 months by trained service personnel.

Clean or replace cooling air filter

– Filter must be cleaned or replaced when soiled or at the latest after 4 weeks.
Replace after 1 year at the latest.

1 Remove cooling-air filter from its slot on the back of machine.

- Replace or clean in warm water with added detergent; dry well.
- Insert cooling-air filter in slot, taking care not to crease it.
- Dispose of used cooling-air filter with domestic waste.

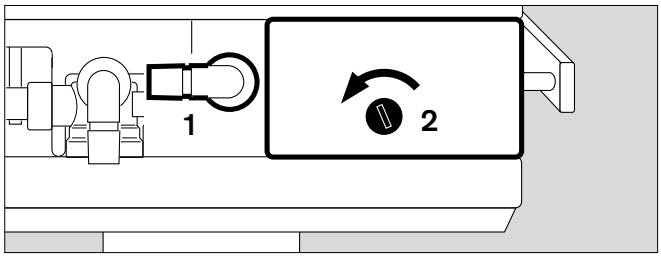


Removing and reinserting ambient-air filter

– Filter must be cleaned or replaced when soiled or at the latest after 4 weeks.
Replace filter every year.

1 Swivel port to the left.

2 Unscrew the screw (e.g. with a coin), and remove the protective cover.

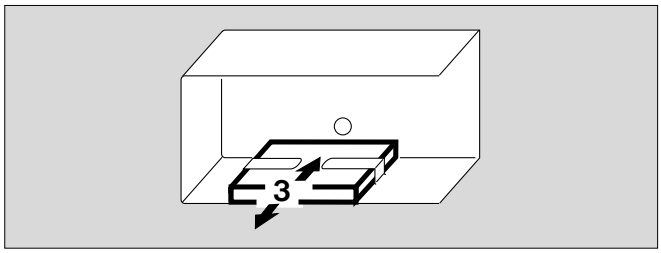


3 Remove the ambient-air filter from the protective cover.

- Replace or clean in warm water with added detergent. Dry well.

3 Push the new / cleaned ambient-air filter under the lugs.

- Replace protective cover, and tighten screw with a coin.
- Dispose of used ambient-air filter with domestic waste.



Correct disposal of batteries and O_2 sensors

Batteries and O_2 sensors:

- Do not incinerate or throw in fire; risk of explosion.
- Do not open using force; risk of corrosion.
- Do not re-charge batteries.

Batteries must be disposed of as special waste:

- Information may be obtained from the local environmental and public health authorities or from approved waste disposal companies.

O_2 sensors can be returned to Dräger

Correct disposal of apparatus

– at the end of its useful life

- After contacting the competent waste disposal company, hand over Evita 2 dura for appropriate disposal.

The applicable legal regulations must be observed.

Description

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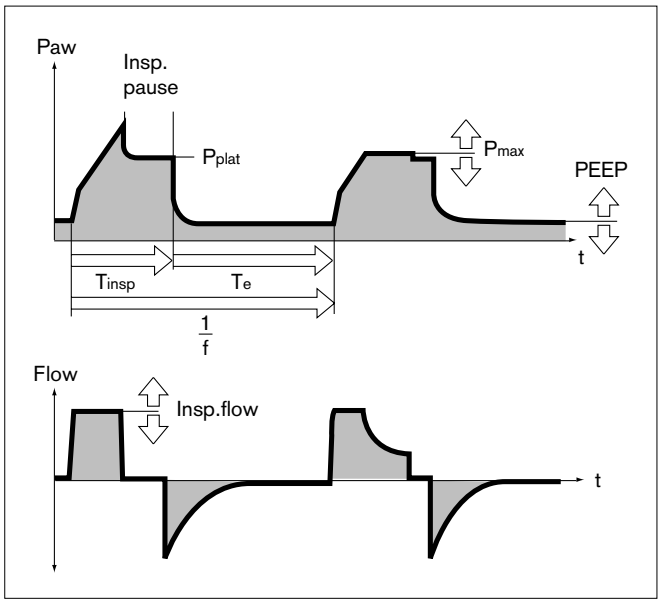
Ventilation Modes

Volume-controlled ventilation with PLV

Classic volume-constant mandatory ventilation stroke

In mandatory ventilation strokes, the »Flow« parameter restricts the inspiration flow. If the inspiration flow is so high that the set tidal volume VT is attained before the inspiration time Tinsp has fully elapsed, the inspiration valve closes, and the supply of breathing gas stops. The expiration valve remains closed until the end of the inspiration time Tinsp. This phase, the inspiratory pause, can be identified as the plateau Pplat in the curve Paw (t).

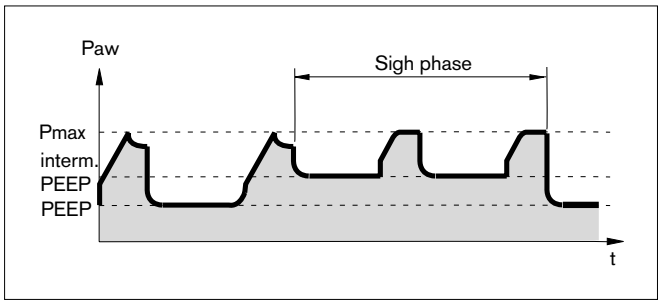


Manual pressure limiting with Pmax

Evita 2 dura can prevent peaks of pressure, while maintaining the set tidal volume VT, by means of the pressure limit Pmax. The tidal volume VT remains constant as long as a pressure plateau Pplat is still detectable and the flow curve shows a brief pause of zero flow between inspiration and expiration.

Evita 2 dura performs this function by reducing the inspiratory flow on reaching the set Pmax value. If the tidal volume VT can no longer be attained with the selected pressure Pmax, due to reduced compliance, the alarm "Volume not constant" is automatically generated. Manual pressure limiting can be performed with all Evita models.

Sigh (intermittent PEEP)



"Sigh", in the form of intermittent PEEP, is operative in IPPV, IPPV Assist and ILV modes.

The purpose of the expiratory sigh during ventilation is to open collapsed areas of the lung, or to keep open "slow" areas of the lung.

Since atelectatic alveoli have a longer time constant – also caused by obstructed bronchioles – increased airway pressure maintained over a longer period is required to open them.

In many cases, the sigh function is achieved by increasing the ventilation stroke; however, due to the short time available, this form of sigh only marginally improves the filling of the "slow" alveoli.

In the Evita 2 dura, the sigh operates during expiration with an intermittent PEEP.

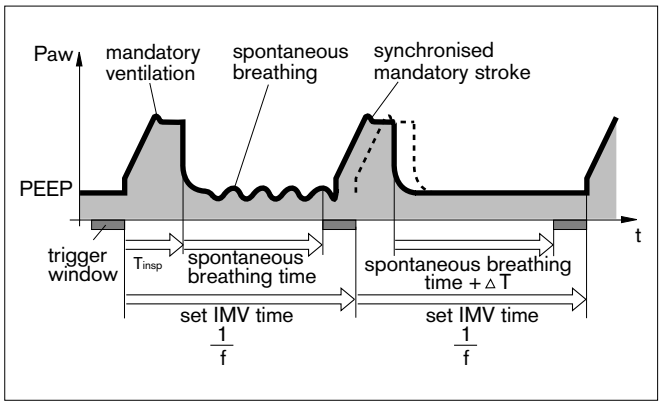
The average airway pressure is higher, and a longer filling time is normally available.

To avoid overinflation of the lung, the peaks of pressure during the sigh phase can be limited by the pressure limit Pmax without impairing the sigh function.

During the sigh phase, the "Volume not constant" alarm is disabled.

SIMV

Synchronised **I**ntermittent **M**andatory **V**entilation



Combination of machine ventilation and spontaneous breathing.

SIMV enables the patient to breathe spontaneously in regular prescribed intervals between mandatory mechanical ventilation strokes that ensure a minimum ventilation.
This minimum ventilation is defined by two set values, tidal volume (V_T) and ventilation frequency (f). The minimum ventilation is the product of V_T x f.

The ventilation pattern is programmed by the following set values: tidal volume V_T, Insp.Flow, frequency f and inspiration time T_{insp}.
To prevent the mandatory ventilation stroke being applied during spontaneous expiration, the Flowtrigger of the machine ensures that the ventilation stroke is triggered within a "trigger window" and synchronised with the patient's spontaneous inspiration.

The "trigger window" is 5 seconds long in adult mode and 1.5 seconds long in paediatric mode. If the expiration times are less than 5 seconds or 1.5 seconds respectively, the trigger window covers the entire expiration time.

Since the synchronisation of the mandatory ventilation stroke reduces the effective SIMV time and therefore would normally result in an undesirable increase in the effective IMV frequency, Evita 2 dura adds back the reduced SIMV time by prolonging the subsequent spontaneous breathing phase by the SIMV time difference Δ T – thus preventing an increase in SIMV frequency. The frequency parameter f remains constant. This parameter, in combination with the tidal volume V_T, sets the minimum ventilation. If the patient has breathed in a considerable inspiratory volume at the beginning of the trigger window, the machine reduces the subsequent mandatory ventilation stroke by shortening the time for the inspiratory flow phase and the inspiration time.
In this way, the tidal volume V_T remains constant, and overinflation of the lungs is avoided.

During the spontaneous breathing phases, the patient can be assisted with pressure by ASB pressure support.

In the course of progressively weaning the patient from artificial ventilation, the ventilation frequency f is further reduced while the spontaneous breathing time is increased, until finally the required total minute volume is supplied entirely by spontaneous breathing. Spontaneous breathing can be assisted by ASB.

ASB

Assisted **S**pontaneous **B**reathing

Pressure support for insufficient spontaneous breathing.

The function of the machine in assisting insufficient spontaneous breathing is similar to that of the anaesthetist who manually assists and monitors the patient's spontaneous breathing by feeling the breathing bag.

The machine takes over part of the inhalation function, with the patient maintaining control of spontaneous breathing.

The CPAP system supplies the spontaneously breathing patient with breathing gas, even if the inspiration effort is weak.

The pressure support of the ASB system is started:

– when the spontaneous inspiration flow reaches the set value of the Flowtrigger, or at the latest
– when the spontaneous inspired volume exceeds 25 mL (12 mL in paediatric mode).

The machine then produces an increase in pressure up to the preselected ASB pressure P_{ASB}, which is adjustable to the breathing requirement of the patient.

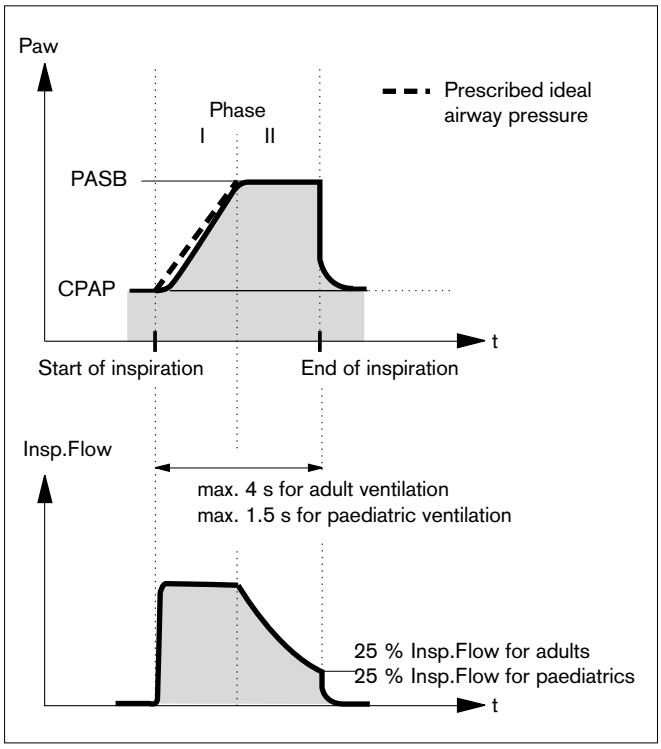
The time for this pressure increase (»Ramp«) is adjustable from 0.05 seconds to 2 seconds.

With a rapid increase in pressure
Evita 2 dura supports the insufficient spontaneous breathing of the patient with a high peak flow.

With a slow increase in pressure
Evita 2 dura begins gently with regular inspiratory flow. The patient has to take over more breathing effort, and so the tone of the breathing muscles gradually improves.

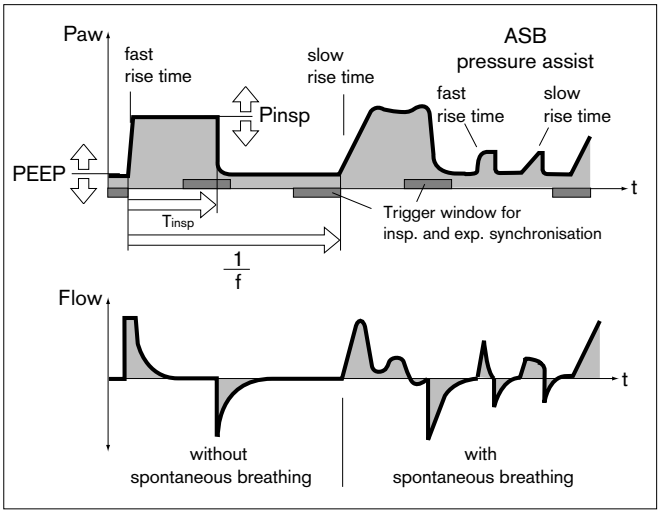
With patient-adjusted pressure increase and the preset ASB level, P_{ASB}, the patient's own breathing activity defines the required inspiration flow, which can rise to 2 L/s in 8 ms.

ASB is terminated:
– when the inspiration flow returns to zero during phase I, i.e. when the patient exhales or fights the ventilator, or
– when the inspiration flow in phase II falls below a certain ratio of the maximum value previously supplied:
  25% Insp. Flow for adults
  25% Insp. Flow for paediatrics
  or
– at the latest after 4 seconds (1.5 seconds in paediatric ventilation) if the two other criteria have not come into operation.
  If this 4-second criterion occurs three times in succession, Evita 2 dura sounds an alarm and warns of a possible leak in the ventilation system.



BIPAP

Biphasic **P**ositive **A**irway **P**ressure



The BIPAP ventilation mode is a pressure/time-cycled ventilation mode in which the patient can always breathe spontaneously. BIPAP is therefore often described as a timed alternation between two CPAP levels.*

The time-cycled change of pressure produces controlled ventilation corresponding to the pressure-controlled ventilation PCV. However, the constant option of spontaneous breathing allows the transition from controlled breathing to independent spontaneous breathing to take place smoothly over the course of the weaning phase, without requiring any change in the ventilation mode. To adapt easily to the patient's spontaneous breathing pattern, the change-over from expiratory pressure level to inspiratory pressure level, and also the change-over from inspiratory pressure level to expiratory pressure level, are synchronised with the patient's spontaneous breathing.

The frequency of the change-over is kept constant, even with patient synchronisation, by defining a trigger time window with a fixed time constant.

The "trigger window" is 5 seconds long in adult mode and 1.5 seconds long in paediatric mode.
For expiration times shorter than 5 seconds or 1.5 seconds respectively, the trigger window covers the entire expiration time.
At P_{insp} level, the "trigger window is" $1/4 \cdot T_{insp}$ seconds long.

This smooth adaptation to the patient's spontaneous breathing requires less sedation, so that the patient returns to spontaneous breathing more rapidly.

As in all pressure-controlled ventilation modes, the patient is not prescribed a fixed tidal volume (V_T).
The tidal volume results principally from the pressure difference between the settings for PEEP and Pinsp.

The display of the tidal volume measured on expiration, V_{Te}, is used to set the required difference between the two pressure levels. Any increase in this difference will cause an increased BIPAP ventilation stroke.

Changes in lung compliance and airways, as well as active 'fighting' by the patient can lead to changes in tidal volume. This is a desired effect in this ventilation mode.

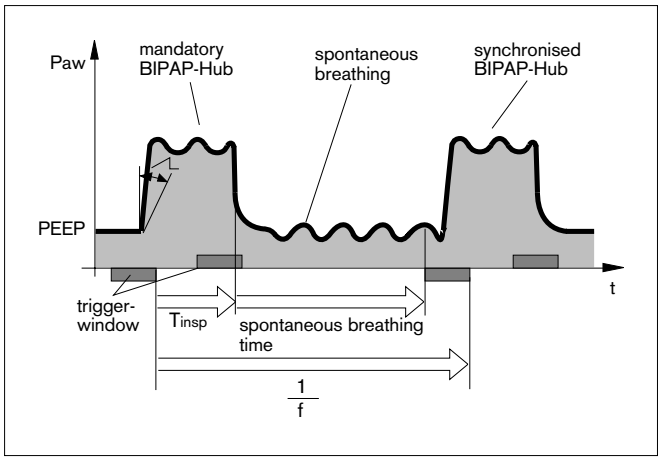
With the knowledge that the tidal volume, and therefore the minute volume, are not constant, the alarm limits for minute volume must be adjusted with care.

* Bibliography (1), (2), (3), (4), (5), (6), (7), (8), (9), (10) page 123

Using BIPAP

As with IPPV, the time pattern is set using the basic setting parameters of frequency f and inspiration time Tinsp. The lower pressure level is set with the PEEP parameter, while the upper level is set with Pinsp. When switching over from IPPV to BIPAP mode – while retaining the time pattern – only the Pinsp setting needs to be changed.

The steepness of the increase from the lower pressure level to the upper pressure level is controlled by the »Ramp« setting. The effective time for the increase in pressure cannot be greater than the set inspiratory time Tinsp.
This precaution ensures that the upper pressure level Pinsp is reached safely during inspiration. The transition from controlled ventilation via the weaning phase to fully spontaneous breathing is achieved by a gradual reduction of the inspiratory pressure Pinsp and / or frequency f.



BIPAPAssist

Biphasic **P**ositive **A**irway **P**ressure Assisted

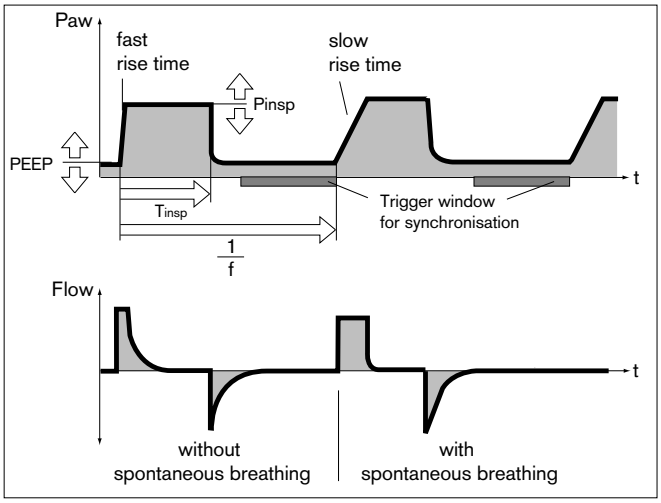
Pressure-controlled, assisted ventilation

The inspiratory strokes are the same as for BIPAP, except that the change from Pinsp to PEEP is not synchronised with expiration by the patient.
The duration of Pinsp depends on Tinsp.
The patient can breathe spontaneously throughout the ventilation process.

Every detected spontaneous breathing activity by the patient triggers a synchronised inspiration stroke.

A non-synchronised inspiratory stroke is triggered by the machine at the latest upon expiry of the inspiration time defined by »f« and »Tinsp«.

For all patients, from those unable to breathe spontaneously to those breathing spontaneously before being weaned off the ventilator.



MMV

Mandatory **M**inute Volume **V**entilation

In contrast to SIMV, the MMV ventilation mode gives mandatory breathing only if spontaneous breathing is not yet sufficient and has fallen below a pre-selected minimum ventilation.
This minimum ventilation is controlled by the two set values tidal volume V_T and frequency f, and results from the product V_T x f.

Unlike SIMV, the mandatory strokes are not given regularly but only in cases of insufficient ventilation.

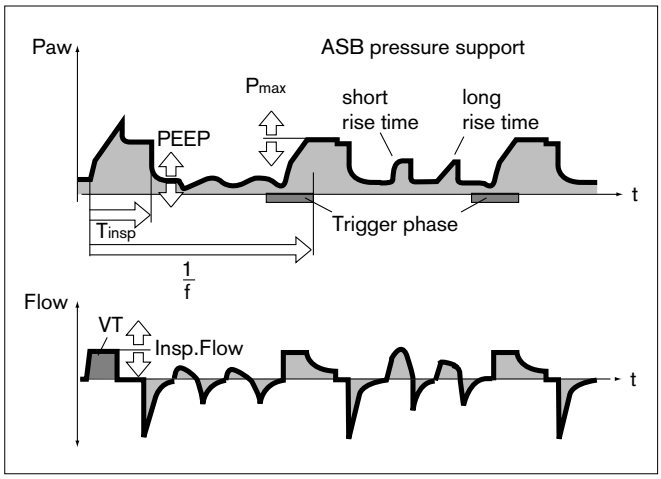
The frequency of mandatory strokes is determined by the level of spontaneous breathing: if spontaneous breathing is sufficient, mandatory strokes are not applied at all.
If spontaneous breathing is not sufficient, intermittent mandatory strokes of the set tidal volume V_T are applied.
If there is no spontaneous breathing at all, the mandatory strokes are applied at the set frequency f.

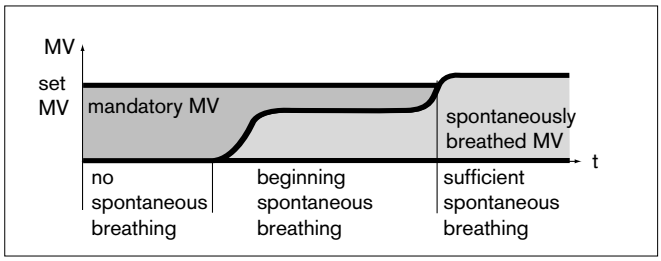
Evita 2 dura continuously monitors the difference between spontaneous breathing and the set minimum ventilation.
As soon as the balance becomes negative, because spontaneous breathing is no longer sufficient, Evita 2 dura applies a mandatory ventilation stroke with the set tidal volume V_T, so that the balance is again positive.

Experience shows that patients breathe very irregularly. Phases of weak breathing alternate with phases of heavy breathing. In order to allow for these individual fluctuations, the balancing process also takes account of the extent by which the set minimum ventilation has been exceeded.
This positive allowance is progressively reduced to zero by Evita 2 dura within a maximum of 7.5 seconds after apnoea.

In other words, the response time of Evita 2 dura before activating mandatory ventilation is automatically adapted to the preceding cycle of spontaneous breathing:

If this spontaneous breathing was close to the minimum ventilation, the machine responds rapidly within the cycle time (1/f). By contrast, if the patient's spontaneous breathing was much higher than the set minimum ventilation, Evita 2 dura tolerates a longer breathing pause. In extreme cases of sudden apnoea after a phase of heavy breathing, the response time will be 7.5 seconds plus the trigger time, with a minimum of 1 cycle time (1/f).





Response times longer than 15 seconds may only occur if the minimum ventilation with a very low IMV frequency f is set to correspondingly low values.

In this case, Evita 2 dura triggers an apnoea alarm that is cancelled again as soon as the mandatory ventilation strokes have been applied. If the cycle time is set to a longer period than the T_{Apnoea} alarm limit, and if there is no spontaneous breathing between the mandatory ventilation strokes, the apnoea alarm will be regularly triggered.
Example: f = 3/min ≙ IMV time = 20 seconds
T_{Apnoea} ≙ 15 seconds
This system is designed to prevent mandatory ventilation being prematurely triggered in the event of irregular spontaneous breathing, whilst at the same time giving an alarm for any long period of low ventilation.

Flow measurement

Regardless of whether ventilation is volume-controlled or pressure-controlled, positive pressures are generated in both the breathing system and patient lung during the inspiration phase.
Depending on the ratio of lung compliance to hose system compliance, the volume delivered by the ventilator is distributed to the patient's lung and to the hose system installed between the ventilator and patient.
Deviations in the measured expiration flow and derived values, such as the minute volume and breath volume, are low for adult patients, due to their relatively high lung compliance in relation to the much lower compliance of the ventilation hoses.

However, since only the volume attained and surrendered by the lung is relevant to the efficiency of ventilation, and since higher differences are possible during paediatric ventilation, Evita 2 dura provides basic compensation for hose compliance during ventilation.

Compensation of the effect of hose system compliance

During the device check before ventilation, Evita 2 dura determines the compliance of the ventilation hoses, and then, during ventilation, compensates for the effect of compliance on volumetric flow measurement.

Depending on the airway pressure, Evita 2 dura increases the tidal volume by the amount that remains in the ventilation hoses.

In addition to hose system compliance, flow/volume measurement is influenced by the environmental factors of temperature and humidity and by leaks in the hose system.
Evita 2 dura takes these factors into account and corrects the settings and measured values accordingly.

Conversion according to ambient conditions

The volume occupied by a gas depends on the ambient conditions of temperature, pressure and humidity.
In lung physiology, the minute volume and tidal volume are related to the ambient conditions in the lung:
37 °C body temperature, pressure in the lung,
100 % relative humidity.

The flow and volume values measured under these conditions are marked with BTPS*. On the other hand, medical gases from cylinders or from the central supply are dry (approx. 0 % r.h.) and are delivered by the ventilator at 20 °C. The flow and volume values measured under these conditions are marked NTPD**.
The difference between measured values under NTPD and BTPS conditions is typically approx. 12 %.

Example: a tidal volume of 500 mL NTPD is increased to 564 mL BTPS by heating to 37 °C and humidifying to 100 % r.h..
Evita 2 dura delivers the tidal volume after conversion, so that the set tidal volume is effective in the lung under BTPS conditions.

* BTPS = Body Temperature, Pressure, Saturated.

** NTPD = Normal Temperature Pressure Dry.

Automatic leakage compensation

Evita 2 dura determines the difference between the delivered flow on the inspiration side and the measured flow on the expiration side.
This difference provides a measure of the amount of leakage and is displayed by Evita 2 dura as the leakage minute volume MV_{leak}. Evita 2 dura can compensate for this leakage in volume controlled ventilation.

Example:
Tidal volume setting V_T = 500 mL, 10 % leakage in tube.

Leakage compensation Off
Evita 2 dura delivers 500 mL. This is indicated as the inspiratory tidal volume V_{Ti}. 50 mL escape as leakage during inspiration, and 450 mL reach the lung. 450 mL are expired, and 45 mL again escape as leakage.
A tidal volume of 405 mL is measured on the expiration side and indicated as V_{Te}.
With a ventilation rate of 10 strokes per minute, a minute volume of 5.0 L/min is delivered on the inspiration side and a minute volume of 4.05 L/min is measured on the expiration side. The lung is ventilated with an MV of 4.5 L/min.
Without leakage compensation, the set V_T determines the volume delivered by Evita 2 dura.

Leakage compensation On
With automatic leakage compensation, Evita 2 dura delivers 550 mL on the basis of the measured leakage minute volume, instead of the 500 mL set.
500 mL enter the lung and the displayed inspiratory tidal volume V_T is 500 mL.
The volume of 450 mL measured on the expiration side is displayed without compensation, even when leakage compensation is activated. The minute volume measured on the expiration side is 4.5 L/min and is also uncompensated.
If this were not so, the alarm for a low minute volume could be inhibited by the expiratory leakage compensation. Evita 2 dura must always emit an alarm if the minute volume is too low.
With leakage compensation, the set V_T determines the volume to be delivered to the patient.

This example has been simplified:
In fact, the calculated leakage correction takes into account the pressures in the hose system. A higher percentage volume is lost on the inspiration side than on the expiration side because the pressure during inspiration is higher. The displayed leakage minute volume MV_{leak} is based on the mean pressure P_{mean}.

The leakage minute volume MV_{leak} also takes the inspiratory leaks into account. The sum of the minute volume MV + the leakage minute volume MV_{leak} is consequently greater than the inspiratory minute volume delivered to the patient.

Unlimited volume compensation is inappropriate.
Evita 2 dura compensates for losses of up to 100 % of the set tidal volume V_T.
Due to technical tolerances, a small leakage minute volume may be displayed even if the hose system is leakproof.

Rapid Shallow Breathing RSB

The Rapid Shallow Breathing index (RSB)* is the quotient of the spontaneous breathing frequency (spontaneously breathed breaths per minute) and the tidal volume:

$$RSB\ [^1/(min \times L)] = \frac{f_{spont}\ [1/min]}{V_T\ [L]}$$

The lower the RSB index for a patient with spontaneous breathing, the more probably he or she can be weaned successfully. The significance of the RSB index is due to the fact that patients who can be weaned successfully tend to have a lower spontaneous breathing frequency and a higher tidal volume than those who are not yet ready to be weaned.
In their 1991 study*, Yang and Tobin showed that the RSB index is an effective instrument for predicting the success of an attempt to wean the patient. Patients with an RSB index < 100 $^1/(min \times L)$ were weaned with a probability of 80 %, while 95 % of those with an RSB index > 100 were not yet ready to be weaned.
Evita 2 dura indicates the RSB index in CPAP/ASB and PPS modes.

Negative Inspiratory Force NIF

The Negative Inspiratory Force index (NIF)** measures the patient's maximum inhalation effort after exhaling. The patient system is closed during measurement of the NIF. This value is also known as the Maximum Inspiratory Pressure (MIP). As a result of the inhalation effort during manually extended expiration, the patient generates a negative pressure in relation to PEEP. The probability that the patient can be weaned successfully increases with the magnitude of this negative pressure. Patients with a NIF < –30 mbar can in all probability be weaned successfully, while those with a NIF of up to –20 mbar will most probably prove unsuccessful.
Evita 2 dura determines the NIF value during manually extended expiration. The patient system closes following expiration by the patient while the »**Exp. hold**« key is held down and Evita 2 dura measures the maximum inhalation effort made by the patient. The NIF is measured as a pressure against PEEP. The measuring procedure is ended when the »**Exp. hold**« key is released or after not more than 15 seconds. The last measured NIF value and the time of measurement are shown in Table 2 on the screen.

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* Bibliography (8), page 123
** Bibliography (9), (10), page 123

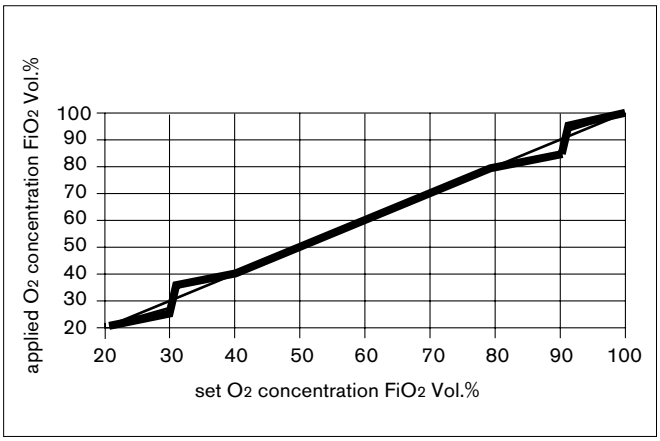
Insp. O_2 concentration during medicament nebulisation

Use only medicament nebuliser 84 12 935 (white central body).

If other medicament nebulisers are used, considerable deviations may occur in the tidal volume and inspiratory O_2 concentration!

To minimise the deviation from the set O_2 concentration, Evita 2 dura generates a mixed gas to drive the medicament nebuliser.
In adult ventilation, this mixed gas is generated by switching over the compressed gases (medical air and oxygen) in synchronisation with inspiration.
In paediatric ventilation, the nebuliser is operated continuously, with medical air or oxygen in alternation. The drive gas of the medicament nebuliser therefore roughly corresponds to the set FiO_2.

The graph shows the possible deviations of the applied O_2 concentration as a function of the set FiO_2 at a minimal inspiratory flow (15 L/min) in adult ventilation, or at ventilation frequencies above 12 bpm in paediatric ventilation.



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What's what

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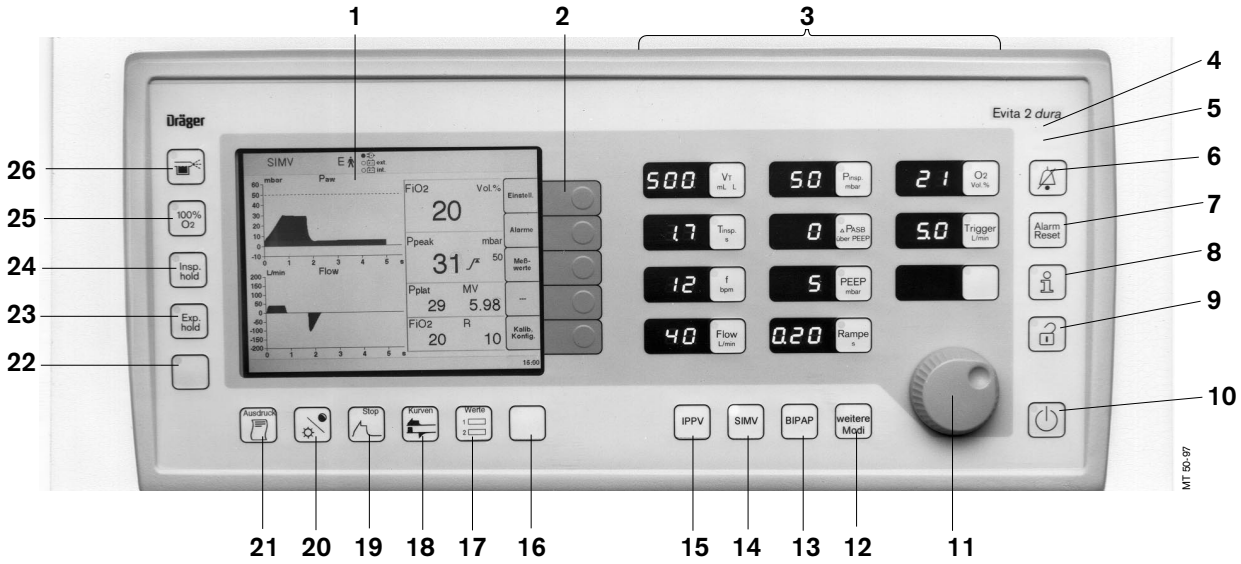
Control unit



1 Screen for displaying application-specific screen pages.

2 Menu keys for displaying the application-specific screen pages.

3 Parameter keys with displays indicating their settings – for setting the ventilation parameters.

4 Red LED to indicate warnings

5 Yellow LED to indicate cautions and advisory messages

6 »🔕« key for suppressing the audible alarm tone for 2 minutes.

7 »**Alarm Reset**« key for acknowledging alarm messages.

8 »ℹ« key for calling up information and help on settings.

9 »🔓« key ("lock") for protecting the ventilation parameters and ventilation mode against unauthorised modification.

10 »⏻« key ("standby") for changing between ventilation and standby.

11 Central "turn and press" rotary knob for selecting and confirming settings.

12 »**Other Modes**« key for using other ventilation modes programmed on-screen.

13 Key for the **BIPAP** ventilation mode.

14 Key for the **SIMV** ventilation mode.

15 Key for the **IPPV** ventilation mode.

16 Key for future functions.

17 »**Values** 1▭ 2▭« key for changing the displayed value set.

18 »**Curves** 📈« key for changing the displayed curve pair.

19 »**Freeze** 📈« key for freezing curves.

20 »☼/●« key for switching the screen brightness between bright / dark.

21 »**Print** 🖨« key for manual printer logging.

22 Key for future functions.

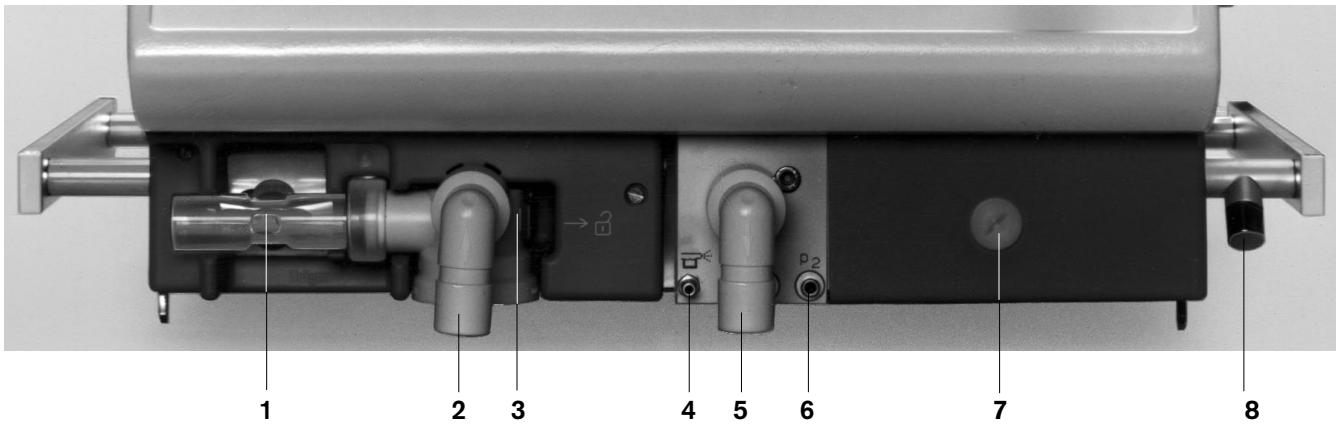
23 »**Exp. hold**« key for manually extending the expiration phase.

24 »**Insp.hold**« key for manual inspiration.

25 »**O2** ↑ **Suction**« key for bronchial suction

26 »🌫« key for switching the pneumatic medicament nebuliser on / off.

Front connection block for ventilation



1 Flow sensor

2 Expiration valve with expiration port

3 Latch for expiration valve

4 Gas supply port for the medicament nebuliser

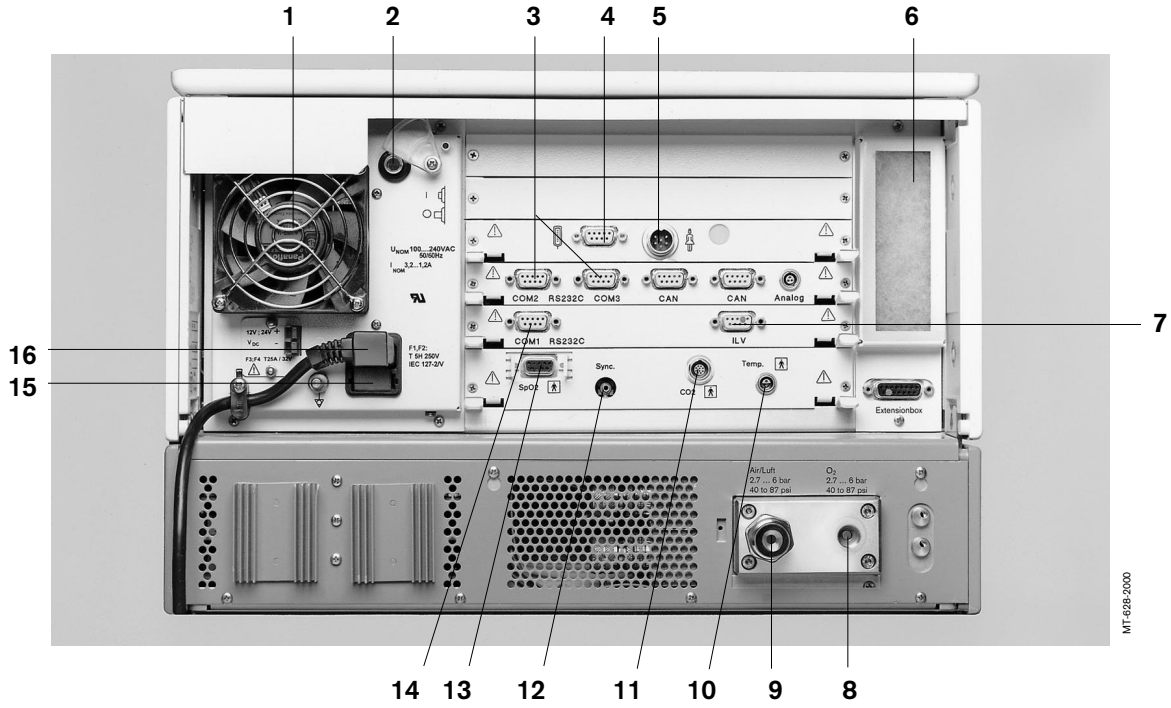
5 Inspiratory port

6 Connections for optional pressure measurement (not yet used)

7 Locking screw for protective cover (behind it: O_2 sensor and ambient-air filter)

8 Park bracket for Y-piece

Back panel



1 Fan

2 Power switch with protective flap

3 »**COM2**«, »**COM3**« sockets for RS 232 and analogue interfaces (optional)

4 Connection » « for Remote Pad, optional

5 Connection » « for nurse call, optional

6 Cooling-air filter

7 ILV socket, optional

8 Connection for oxygen

9 Connection for medical air

10 »**Temp** « socket for temperature sensor

11 »**CO2** « socket for CO_2 sensor, optional

12 »**Sync.**« socket for C-Lock-ECG synchronisation for optional SpO_2 measurement, optional

13 »**SpO2** « socket for functional SpO_2 measurement, optional

14 »**COM1 RS232C**« socket for RS 232 interface, e.g. for printer

15 Mains fuses

16 Connector for power cord

Abbreviations

Abreviation	Definition
APRV	**A**irway **P**ressure **R**elease **V**entilation Spontaneous breathing at continuous positive airway pressure with short-term pressure release
ASB	**A**ssisted **S**pontaneous **B**reathing Pressure supported spontaneous breathing
BIPAP	**Bi**phasic **P**ositive **A**irway **P**ressure Ventilation mode for spontaneous breathing at continuous positive airway pressure with two different pressure levels
BIPAP$_{Assist}$	**Bi**phasic **P**ositive **A**irway **P**ressure Assisted Ventilation mode for assisted ventilation with continuous positive airway pressure with two different pressure levels
Body Wt	Body weight (kg)
bpm	breaths per minute
BTPS	**B**ody **T**emperature, **P**ressure. **S**aturated Measured values based on the condition of the patient's lungs, with body temperature 37 °C, steam-saturated gas, atmospheric pressure
C	Compliance
CPAP	**C**ontinuous **P**ositive **A**irway **P**ressure Breathing with continuous positive pressure in the airways
etCO_2	End-expiratory CO_2 concentration
FeCO_2	Expiratory CO_2 concentration
f	Frequency
f_{Apnoea}	Frequency setting for apnoea ventilation
f_{mand}	Mandatory mechanical portion of overall breathing frequency
f_{spn}	Spontaneous breathing portion of overall breathing frequency
Fail to cycle	Breathing cycle failure. Machine detects no inspiration
FiO_2	Inspiratory O_2 concentration
Flow	Set value of the maximum inspiratory flow
HME	**H**eat **M**oisture **E**xchanger Heat and moisture exchanger
Int. PEEP	Intermittent Positive End-Expiratory Pressure = Sigh
IPPV	**I**ntermittent **P**ositive **P**ressure **V**entilation
IPPV$_{Assist}$	Trigger Assist Intermittent Positive Pressure Ventilation
IRV	**I**nversed **R**atio **V**entilation Ventilation with inversed inspiration/expiration ratio
ISO 5369	International standard for mechanical ventilators – "Lung Ventilation"

Abreviation	Definition
I:E	Ratio of Inspiration to Expiration
MMV	**M**andatory **M**inute Volume **V**entilation
MV	**M**inute **V**olume
MV_{leak}	Leakage minute volume
MV_{spn}	Spontaneous breathed minute volume
NIF	**N**egative **I**nspiratory **F**orce Maximum inhalation effort
O_2	Set value for inspiratory oxygen concentration [Vol.%]
P_{ASB}	Set value of ASB pressure support
P_{aw}	Airway pressure
PEEP	**P**ositive **E**nd-**E**xpiratory **P**ressure
$PEEP_i$	Intrinsic Positive End-Expiratory Pressure
P_{high}	Set value of the upper pressure level APRV
P_{insp}	Set value of the upper pressure level in BIPAP
P_{max}	Set value for pressure limited ventilation
P_{mean}	Mean airway pressure
PLV	**P**ressure **L**imited **V**entilation
P_{peak}	Peak pressure
P_{plat}	End-inspiratory airway pressure
P_{tief}	Set value of the lower pressure level in BIPAP
R	Resistance
Ramp	Setting for the temporary pressure increase in ASB
RSB	**R**apid **S**hallow **B**reathing Quotient of spontaneous breathing frequency and tidal volume
SIMV	**S**ynchronised **I**ntermittent **M**andatory **V**entilation
T	Inspiratory breathing gas temperature
T_{Apnoea}	Apnoea alarm time
T_e	Expiration time
T_{high}	Time for the upper pressure level in APRV
T_{insp}	Set value of the inspiratory time
T_{low}	Time for the lower pressure level in APRV
$\dot{V} CO_2$	CO_2 production [L/min]
V_{ds}	Serial dead space

Abreviation	Definition
V_T	Setting for tidal volume
VT_{Apnoea}	Setting for tidal volume of apnoea ventilation
VT_{ASB}	Inspiratory breathing volume during an ASB stroke
V_{Te}	Expiratory tidal volume
V_{Ti}	Inspiratory tidal volume
V_{trap}	Volume trapped in the lung by intrinsic PEEP, and exhaled during subsequent expiration.

Symbols

Symbol	Definition
	Switch medicament nebuliser on / off
	Activate/deactivate oxygen enrichment for bronchial suction
	Start manual inspiration
	Manually extend the expiration phase
	Switch help function on / off
	Manual printer logging
	Bright / dark screen brightness setting
	"Freeze" curves in screen
	Select other combination of measured values
	Select other curve(s)
	Suppress audible alarm for 2 minutes
	Acknowledge alarms
	Protect ventilation parameters and ventilation mode
	Standby / Operation
	Lower / upper alarm limit
	Observe Instructions for Use!
	Protection class Type B
	Protection class Type BF
	Insert flow sensor
	Unlocking expiration valve
	Evita Remote Pad
	Nurse call

Technical Data

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Technical Data

Environmental conditions

In operation	
Temperature	10 to 40 °C
Atmospheric pressure	700 to 1060 hPa
Rel. humidity	0 to 90 %
In storage	
Temperature	–20 to 60 °C
Atmospheric pressure	500 to 1060 hPa
Rel. humidity	0 to 100 %

Settings

Ventilation modes	IPPV / IPPV Assist, SIMV, SIMV / ASB MMV, MMV / ASB BIPAP / ASB BIPAP$_{Assist}$ CPAP / ASB
Ventilation frequency f	0 to 100/min
Inspiration time T_{insp}	0.1 to 10 s
Inspiration time V_T	
Paediatrics	0.02 to 0.3 L, BTPS*
Accuracy	±10 % of set value, or ±10 mL, whichever is greater.
Adults	0.1 to 2.0 L, BTPS*
Accuracy	±10 % of set value, or ±25 mL, whichever is greater.
Inspiratory Flow	
Paediatrics	6 to 30 L/min
Adults	6 to 120 L/min
Inspiratory pressure P_{insp}	0 to 80 mbar
Inspiratory pressure limit P_{max}	0 to 100 mbar
O_2 concentration	21 to 100 Vol.%
Accuracy	±5 % of set value, or ±2 Vol.%, whichever is greater.

* BTPS = Body Temperatur, Pressure, Saturated.
Measured values with reference to the conditions of the patient lung, Body temperature 37 °C, steam-saturated gas, ambient pressure.

Positive end-expiratory pressure PEEP or interm. PEEP	0 to 35 mbar
Trigger sensitivity	0.3 to 15 L/min
Pressure assist PASB	0 to 80 mbar
rise time for pressure support (Ramp)	0 to 2 s
I:E	1:9.5 to 4:1 (can only be configured in default settings)

Performance data

Control principle	Time-cycled, volume-constant, pressure-controlled
Intermittent PEEP frequency	2 cycles every 3 minutes
Medicament nebulisation	for 30 minutes
Bronchial suction	
disconnection detection	automatic
reconnection detection	automatic
oxygen enrichment	max. 3 minutes
active suction phase	max. 2 minutes
final oxygen enrichment	2 minutes
Valve response time $T_{0...90}$	≤5 ms
Supply system for spontaneous breathing and ASB	adaptive CPAP system with high initial flow
max. flow rate	2 L/s in 8 ms
max. inspiratory flow	180 L/min
Equipment compliance (with humidifier, Aquapor and patient tubing system for adults)	≤2 mL/mbar
Inspiration resistance	≤2.3 mbar/L/s
Expiration resistance	≤3.8 mbar/L/s
Equipment compliance (with Fisher & Paykel MR 730 humidifier and tubing system K for paediatric use)	≤1 mL/mbar
Inspiration resistance	≤4.1 mbar/L/s
Expiration resistance	≤4.1 mbar/L/s
Additional functions:	
Inspiratory relief valve	Opens if medical air supply fails (pressure <1.2 bar), enables spontaneous breathing with filtered ambient air.
Safety valve	Opens the breathing system at 100 mbar.

Measured value displays

Airway pressure measurement

Max. airway pressure	Ppeak
Plateau pressure	Pplat
Pos. end-exp. pressure	PEEP
Mean airway pressure	Pmean
Min. airway pressure	Pmin
Range	0 to 99 mbar
Resolution	1 mbar
Accuracy	±2 mbar

O_2 measurement in main flow (inspiratory side)

Inspiratory O_2 concentration FiO_2	
Range	15 to 100 Vol.%
Resolution	1 Vol.%
Accuracy	±3 Vol.%

Flow Measurement

Minute Volume MV	
Spontaneously breathed minute volume MV_{spon}	
Range	0 to 99 L/min, BTPS*
Resolution	0.1 L/min
Accuracy	±8 % of measured value
$T_{0...90}$	approx. 35 s
Tidal volume VTe	
Spontaneously breathed tidal volume VT_{spon}	
Range	0 to 3999 mL, BTPS*
Resolution	1 mL
Accuracy	±8 % of measured value
Tidal volume VT_{ASB}	
Inspiratory tidal volume during an ASB stroke	
Range	0 to 3999 mL, BTPS*
Resolution	1 mL
Accuracy	±8 % of measured value

Frequency Measurement

Breathing frequency f	
Spontaneous breathing frequency f_{spon}	
Range	0 to 150 /min
Resolution	1 /min
Accuracy	±1 /min
$T_{0...90}$	approx. 35 s

Breathing gas temperature measurement

Range	18 to 51 °C
Resolution	1 °C
Accuracy	±1 °C

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* BTPS = Body Temperatur, Pressure, Saturated.
Measured values relating to the conditions of the patient lung,
Body temperature 37 °C, steam-saturated gas, ambient pressure.

Computed value displays

Compliance C	
Range	0.7 to 200 mL/mbar
Resolution	
Range 0.7 to 99.9 mL/mbar	0.1 mL/mbar
Range 100 to 200 mL/mbar	1 mL/mbar
Accuracy	±20 % of measured value*
Resistance R	
Range	3 to 200 mbar/L/s
Resolution	
Range 3 to 99.9 mL/mbar	0.1 mbar/L/s
Range 100 to 200 mL/mbar	1 mbar/L/s
Accuracy	±20 % of measured value**
Leakage minute volume MV_{leak}	
Range	0 to 99 L/min, BTPS
Resolution	0.1 L/min or for values less than 0.1 L/min: 0.01 L/min
Accuracy	±18 % of measured value
$T_{0...90}$	approx. 35 s

Curve displays

Airway pressure Paw (t)	–10 to 100 mbar
Flow Flow (t)	–150 to 180 L/min
Volume V (t)	0 to 2000 mL
Rapid Shallow Breathing RSB	
Range	0 to 9999 ^{1}/(min x L)
Resolution	^{1}/(min x L)
Accuracy	see measurement of V_T and f
Negative Inspiratory Force NIF	
Range	–45 to 0 mbar
Resolution	1 mbar
Accuracy	±2 mbar

Monitoring

Expiratory minute volume MV	
Upper alarm limit alarm	when MV exceeds the upper alarm limit.
Setting range	41 to 1 L/min in 0.1 L/min steps 1 to 0.1 L/min in 0.01 L/min steps
Lower alarm limit alarm	when MV falls below the lower alarm limit.
Setting range	40 to 1 L/min in 0.1 L/min steps 1 to 0.01 L/min in 0.01 L/min steps

* C-values may be considerably falsified as spontaneous breathing increases; compliance with the measuring accuracy therefore cannot be guaranteed for spontaneous breathing.

** R-values may be considerably falsified as spontaneous breathing increases; compliance with the measuring accuracy therefore cannot be guaranteed for spontaneous breathing.

Airway pressure P_{aw}	
Upper alarm limit alarm	when the "Paw high" value is exceeded.
Setting range	10 to 100 mbar
Lower alarm limit alarm	when the value "PEEP +5 mbar" (coupled with the PEEP set value) is not exceeded for at least 96 ms in 2 successive ventilation strokes.
Insp. O_2 concentration FiO_2	
Upper alarm limit alarm	if FiO_2 exceeds the upper alarm limit for at least 20 seconds.
Lower alarm limit alarm	if FiO_2 falls below the lower alarm limit for at least 20 seconds.
Range	both alarm limits are automatically allocated to the set value: less than 60 Vol.%: ±4 Vol.% 60 Vol.% and over: ±6 Vol.%
Insp. breathing gas temperature	
Upper alarm limit alarm	when temperature reaches 40 °C (Evita 2 dura can also be used without temperature sensor if the sensor is not connected on switching on).
Tachypnoea monitoring	
Alarm	when the spontaneous breathing frequency is exceeded during spontaneous breathing.
Adjustment range	5 to 120/min
Volume monitoring	
Lower alarm limit	if the set tidal volume V_T (coupled with the set value V_T) has not been supplied.
Upper alarm limit	if the applied tidal volume exceeds the value of the alarm limit, inspiration is interrupted and the expiration valve is opened.
Adjustment range	0.021 to 4.0 L
Apnoea alarm time	
Alarm	if no breathing activity is detected.
Adjustment range	5 to 60 s, adjustable in 1 second steps.

Operating data

Mains power connection	100 V to 240 V 50 / 60 Hz
Current input	
at 230 V	max. 1.3 A
at100 V	max. 3.2 A
Power consumption	typically approx. 125 W
Machine fuses	
range 100 V to 240 V	F 5 H 250 V IEC 127-2 (2x)

Protection class	
Machine	Class I
CO_2 sensor (sensor connected)	Type BF
Temperature sensor AWT 01 (sensor connected)	Type BF
Gas supply	
O_2 gauge pressure	3 bar –10 % to 5.5 bar +10 % at 60 L/min (peak flow 200 L/min)
O_2 connection thread	M 12 x 1, female
air gauge pressure	3 bar –10 % to 5.5 bar +10 % at 60 L/min (peak flow 200 L/min)
air connection thread	M 20 x 1.5, male The gases must be dry and free from oil and dust.
Gas consumption of control system	Medical air or O_2 approx. 3.5 L/min
Output for pneumatic medicament nebuliser	Medical air or O_2, max. 2 bar, max. 10 L/min
Automatic gas switch-over	if one gas fails (inlet pressure < 1.5 bar), the device switches to the other gas.
Sound pressure (for free-field measurement over a reflecting surface)	max. 47 dB (A)
Dimensions (W x H x D)	
Basic machine	530 x 290 x 450 mm
Machine with trolley	580 x 1335 x 660 mm
Weight	
Basic machine	approx. 27 kg
Basic machine with trolley incl. cabinet 8H	approx. 69 kg

Machine outputs

Digital output	Output and reception via an RS 232 C interface
COM 1	LUST protocol Baudrate: 1200, 2400, 4800, 9600, 19200 baud Data bits: 7 Parity: even Stop bits: 1
	MEDIBUS protocol Baudrate: 1200, 2400, 4800, 9600, 19200 baud Data bits: 8 Partiy: even, odd, no Stop bits: 1 or 2 (19200 baud are required for transmission of high-speed data, e.g. for flow curve)
	Printer protocol HP Deskjet, series 500 Baudrate: 1200, 2400, 9600, 19200 baud Data bits: 8 Parity: no Stop bits: 1

Cable length	Up to 15 m
Load impedance	3000 to 7000 ohm
Signal level (at load impedance 3000 to 7000 ohm)	
Low	Between 3 and 15 V
High	Between –3 and –15 V
Electrical isolation	Port COM 1 is electrically isolated from the machine electronics. The test voltage for the electrical isolation equals 1500 V.
Pin assignment	Pin 2 RxD Pin 3 TxD Pin 5 GND Connector housing Machine housing
Digital output	Output for independent lung ventilation (ILV)
Digital output (optional)	for output and reception via two RS 232 C interfaces
Digital output (optional)	for output and reception via a CAN interface
Analogue output (optional)	for output and reception via a CAN interface

Electromagnetic compatibility (EMC)
(conforming to European Directive 89/336/EEC)

Tested in accordance with EN 60601-1-2

Classification
as per EC Directive 93/42/EEC
Annex IX

II b

UMDNS-Code
Universal Medical Device Nomenclature System – Nomenclature for medical products

17-429

Materials used

Part	Appearance	Material
Ventilation hose	milky, transparent	silicone rubber
Water traps	yellow, transparent	polysulphone
Y-piece	yellow, transparent	polysulphone
with connector for temperature measurement	milky, transparent	silicone rubber
Expiration valve housing, closure	white	polyamide
Diaphragm	whitish and grey	silicone rubber and aluminium
CO_2 cuvette	yellow, transparent	polysulphone with glass windows
Temperature sensor / cable	milky / green or blue	silicone rubber
CO_2 sensor / cable	grey / grey	polyurethane

Parts List / Order List

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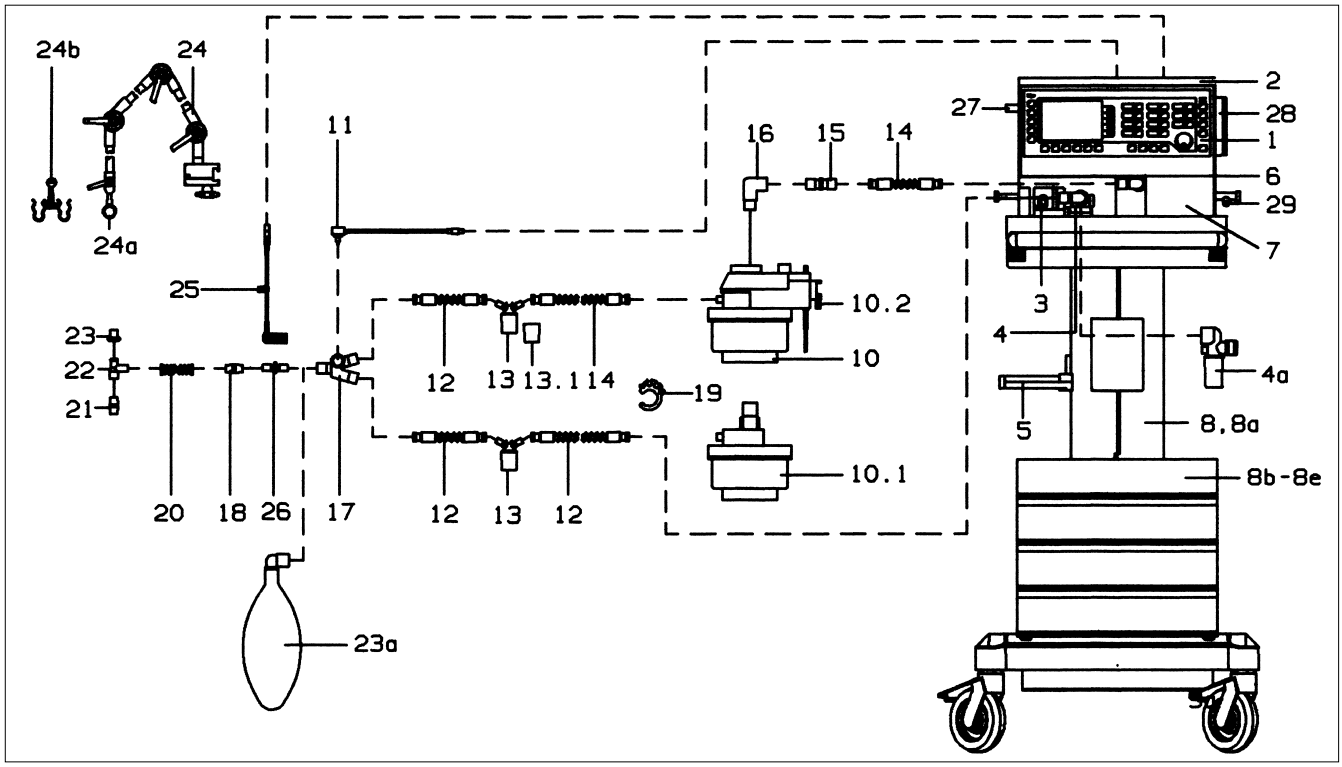
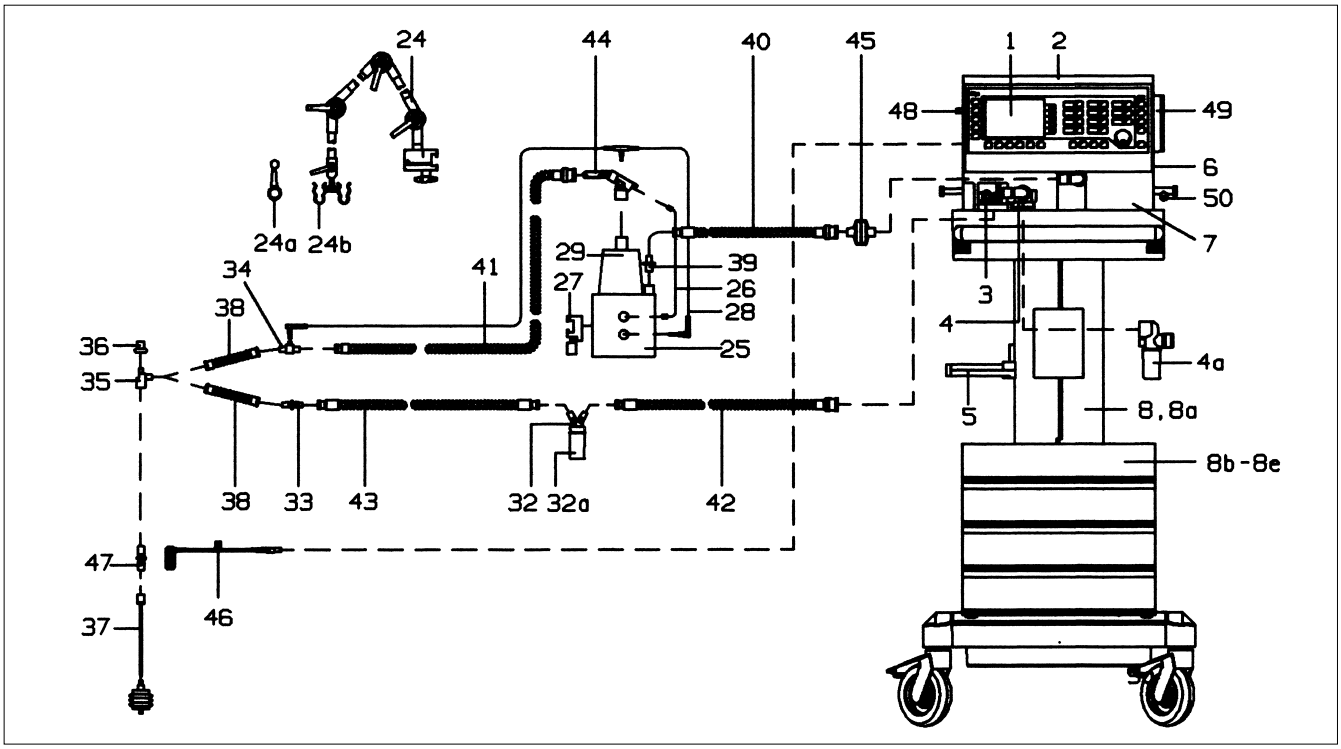
For adult ventilation



Item No.	Name/Description	Order No.
1	Evita 2 dura	84 11 800
2	Instrument tray	84 11 621
3	Flow sensor (set of 5)	84 03 735
4	Expiration valve (expiration valve)	84 10 580
5	Bracket (for Aquapor)	84 11 956
6	O_2 sensor housing	68 50 645
7	Ambient-air filter	84 12 384
7a	Cooling-air filter (back of Evita 2 dura, not illust.)	84 12 384
8	"EvitaMobil" trolley (high)	84 11 950
8a	"EvitaMobil" trolley (low)	84 11 965
8b	Cabinet 8H, 360 mm high (4 drawers)	M 31 796
8c	Cabinet 4H (2 drawers) (not illust.)	M 31 795
8d	"EvitaMobil" cylinder holder set (not illust.)	4 11 970
8e	Breathing air compressor (not illust.)	84 13 890
10	Aquapor (220 – 240 V)	84 05 020
	Aquapor (110 V)	84 05 199
10.1	Patient part, Aquapor	84 05 029
10.2	Set of spare brackets	84 03 345
11	Temperature sensor	84 05 371
12-23	Hose set, adult (blue socket)	84 12 092
12	Spiral hose, adult, silicone 0.6 m	21 65 627

Item No.	Name/Description	Order No.
13-13.1	Water trap	84 04 985
13.1	Water container	84 03 976
14	Spiral hose, adult, silicone 0.35 m	21 65 619
15	Connector	M 25 647
16	ISO elbow connector	M 25 649
17	Y-piece, straight	84 05 435
18	Catheter connector, straight, size 12.5 (set of 10)	M 23 841
19	Hose clamp	84 03 566
20	Corrugated hose 0.32 m	84 02 041
21	Catheter connector, adult Set of catheter connectors, adult Sizes 6 to 12 (set of 12)	84 03 685
22	Adaptor, adult	84 03 076
23	Cap (set of 5)	84 02 918
23a	Adult test lung (bag)	84 03 201
24-24b	Hinged arm	84 09 609
or	Quick-fix hinged arm 2	2M 85 706
24a	Bracket	84 09 746
24b	Hose clamp	84 09 841
25-27	Option CapnoPlus	84 13 780
25	CO_2 main flow sensor	68 70 300
26	Cuvette, adult	68 70 279
27	Holder for parking CO_2 sensor	84 12 840
28	Short GA holder set	84 11 615
29	Y-piece parking rest	84 11 784

For paediatric ventilation



Item No.	Name/Description	Order No.
1	Evita 2 dura	84 11 800
2	Instrument tray	84 11 621
3	Flow sensor (set of 5)	84 03 735
4	Expiration valve (expiration valve)	84 10 580
5	Bracket (for Aquapor)	84 11 956
6	O_2 sensor housing	68 50 645
7	Ambient-air filter	84 12 384
7a	Cooling-air filter (back of Evita 2 dura, not illust.)	84 12 384
8	"EvitaMobil" trolley (high)	84 11 950
8a	"EvitaMobil" trolley (low)	84 11 965
8b	Cabinet 8H, 360 mm high (4 drawers)	M 31 796
8c	Cabinet 4H (2 drawers) (not illust.)	M 31 795
8d	"EvitaMobil" cylinder holder set (not illust.)	4 11 970
8e	Breathing air compressor (not illust.)	84 13 890
24-24b	Hinged arm	84 09 609
or	Quick-fix hinged arm 2	2M 85 706
24a	Bracket	84 09 746
24b	Hose clamp	84 09 841
26-28	Humidifier, basic unit MR 730 (Fisher & Paykel)	23 47 000
26	Hose heater adapter	84 11 097
27	Mounting set (clamps for rail)	23 47 010
28	Double temperature sensor	23 47 007
29-30	Humidifier chamber MR 340	23 47 002
30	Filter paper (set of 200, not illustr.)	23 47 004

Item No.	Name/Description	Order No.
31	Single-strand wire 1.5 m (not illustr.)	23 47 013
32-43	Hose set, paediatrics (Fisher & Paykel)	84 12 081
32-32a	Condensation trap, expiration	84 09 627
32	Water container	84 03 976
33	Double conical connector	84 09 897
34	Temperature sensor mounting	84 11 044
35	Adapter K90	84 03 075
36	Cap 5x	84 01 645
37	Bellows, paediatric, complete	84 09 742
38	Corrugated hose, flex, 0.7 m	84 09 634
39	Catheter connector, size 11	M 19 351
40	Spiral hose, paediatric, silicone 22/10, 0.40 m	21 65 856
41	Spiral hose, paediatric, silicone 22/10, 1.10 m	21 65 651
42	Spiral hose, paediatric, silicone 22/10, 0.60 m	21 65 821
43	Spiral hose, paediatric, silicone 10/10, 0.60 m	21 65 848
44	Hose heater 1.10 m	23 47 020
45	Bacterial filter	84 09 716
46-48	Option CapnoPlus	84 13 780
46	CO_2 main flow sensor	68 70 300
47	Cuvette, paediatrics	68 70 280
48	Holder for parking CO_2 sensor	84 12 840
49	Short GA holder set 84 11 615	
50	Y-piece parking rest	84 11 784

Order List

Name/Description	Order No.
Basic unit	
Evita 2 dura	84 11 800
Accessories required for operation	
Hinged arm	84 09 609
or	
Quick-fix hinged arm 2	2M 85 706
O_2-connecting hose 3 m, neutral colour[1)]	M 34 402
or	
O_2-connecting hose 5 m, neutral colour[1)]	M 34 404
Medical air connecting hose 3 m, neutral colour[1)]	M 34 408
or	
Medical air connecting hose 5 m, neutral colour[1)]	M 34 409
EvitaMobil trolley	84 11 950
For adult ventilation	
Temperature sensor	84 05 371
Aquapor humidifier	84 05 020
Set of spare brackets	84 03 345
Hose set, adult consisting of: patient hoses, water traps, Y-piece, catheter connectors	84 12 092
For paediatric ventilation	
Humidifier, basic unit, MR 730 (Fisher & Paykel), incl. adaptor, hose heater	MR 730
Mounting set (rail brackets)	23 47 010
Humidifier chamber, MR 340	23 47 002
Double temperature sensor	23 47 007
Single-strand wire, 1.5 m	23 47 013

1) The following hoses, which are no longer included in the standard range supplied by Dräger as from 13.06.98 onwards, can also be used:

O_2 connecting hose 3 m, blue	M 29 231
O_2 connecting hose 5 m, blue	M 29 251
Medical air connecting hose 3 m, yellow	M 29 239
Medical air connecting hose 5 m, yellow	M 29 259

Name/Description	Order No.
Hose set, paediatric (Fisher & Paykel) consisting of: hose heater 84 11 045, patient hoses, water traps, Y-piece, catheter connectors,	84 12 081
Bacterial filter	84 09 716
Special accessories	
Instrument tray	84 11 621
Holder for quick reference manual (Instructions for Use, short version)	84 11 615
Wall bracket, module 2000 Type 13 alternative to trolley	84 08 613
Pneumatic medicament nebuliser	84 12 935
For manual ventilation:	
Resutator 2000	21 20 046
Paediatric Resutator 2000	21 20 984
Baby-Resutator	21 20 941
Hook for Resutator	M 26 349
Adult test lung, consisting of:	84 03 201
Mask manifold	M 25 649
Catheter connector ISO size 7	M 25 591
Breathing bag, 2 L	21 65 694
For trolley:	
Cabinet unit 8H, 360 mm high	M 31 796
For supplying Evita 2 dura with medical air:	
Breathing air compressor	84 13 890
Standby option	84 13 939
Special voltage transformer	84 13 936
MEDIBUS cable	83 06 488
Printer cable	83 06 489
Options	
Installation set, Ventilation Plus	84 13 540
Installation set, Monitoring Plus	84 13 545
Installation set, Service Plus	84 13 550
Installation set, Evita Link	84 11 735
Installation set, Evita Sat	84 13 035
Installation set, Evita 4 DC	84 13 034

Name/Description	Order No.
Installation set, CapnoPlus	84 13 780
Accessories for Evita 2 dura CapnoPlus:	
Adult cuvette	68 70 279
Paediatric cuvette	68 70 280
CO_2 main flow sensor	68 70 300
Bracket for parking CO_2 sensor	84 12 840
Modification set – Mask ventilation (NIV)	84 14 474
Modification set – Nurse call	84 14 476
Plug for connecting the nurse call	18 46 248
Modification set – EvitaRemote	84 14 472
Upgrade modification set – Software 4.0 Evita 2 dura	84 14 468
Upgrade modification set – Software 4.0 plus Evita 2 dura	84 14 470
Modification set – 2nd pressure sensor	84 14 479
For CO_2 measurement (option)	
Test filter	68 70 281
Calibration set	84 12 710
Test gas cylinder 5 Vol.% CO_2, 95 Vol.% N_2	68 50 435
Spare set for sterilisation	
Expiration valve (expiration valve)	84 10 580
For adult ventilation:	
Hose set, adult	84 12 092
Patient part for Aquapor	84 05 029
Temperature sensor	84 05 371
Pneumatic medicament nebuliser	84 12 935
Cuvette, adult	68 70 279
For paediatric ventilation:	
Hose set, paediatric (Fisher & Paykel)	84 12 081
Humidifier chamber MR 340 incl. filter paper for humidifier chamber (set of 100)	MR 340
Cuvette, paediatric	68 70 129
Replacement parts	
For Evita 2 dura:	
O_2 sensor capsule	68 50 645
Flow sensor (set of 5)	84 03 735
Lithium battery for data protection	18 35 343
Cooling air filter, blue	84 12 384
For hinged arm:	
Holder	84 09 746
Hose clamp	84 09 841

Name/Description	Order No.
For adult ventilation:	
Temperature sensor	84 05 371
Replacement set of lids for Aquapor	84 06 135
Aquapor bowl	84 04 739
Aquapor float	84 04 738
Spiral hose, adult, silicone 0.6 m	21 65 627
Spiral hose, adult, silicone 0.35 m	21 65 619
Water trap	84 04 985
Water container	84 03 976
Hose clamp	84 03 566
Connector	M 25 647
Y-piece	84 05 435
Catheter connector, straight, size 12.5 (set of 10)	M 23 841
Corrugated hose	84 02 041
Adaptor, adult	84 03 076
Set of catheter connectors, adult	84 03 685
Set of caps (set of 5)	84 02 918
ISO elbow connector	M 25 649
For paediatric ventilation:	
Spiral hose, paediatric, silicone, 22/10, 1.10 m	21 65 651
Spiral hose, paediatric, silicone, 22/10, 0.60 m	21 65 821
Spiral hose, paediatric, silicone, 10/10, 0.60 m	21 65 848
Spiral hose, paediatric, silicone, 22/10, 0.40 m	21 65 856
Corrugated hose flex 2 x 7 cm	84 09 634
Catheter connectors, size 11 (set of 10)	M 19 351
Cap	84 01 645
Adaptor, paediatric, 90°	84 03 075
Double conical connector	84 09 897
Temperature sensor mounting	84 11 044
Condensation trap, expiration	84 09 627
Water container	84 03 976
Hose heater 1.10 m	23 47 020
Temperature sensor	23 47 007
Adaptor for hose heater	84 11 097
Single-strand wire, 1.5 m	23 47 013
Humidifier chamber, MR 340, incl. filter paper (set of 100)	23 47 002
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These Instructions for Use apply only to
Evita 2 dura
with Serial No.:

If no Serial No. has been filled in by Dräger these Instructions for Use are provided for general information only and are not intended for use with any specific machine or device.

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